The Builder.

VOL. XXXVI. No. 1850. SATURDAY, JULY 20, 1878.

ILLUSTRATIONS.

The New Industrial Museum, Berlin.—Professor Gropius, Architect 750
Buildings at the Paris Exhibition: The Belgian Façade.—M. Émile Jaulet, Architect 752
London Street Architecture: Messrs. Marshall & Snelgrove's Premises, Oxford-street.—Mr. Octavius Hansard, Architect 753

CONTENTS.

Geometry and Optics of Ancient Architecture 739
Is the Health of East London worth Attention? 741
Some Things which Interest us at the Paris Exhibition 743
Cyprus Island and its Antique Art 744
The Microphone 745
Harrogate 746
Works in Edinburgh 746
Opening of the "Empress" Bridge, Indus Valley State Railway 747
Berkshire Archæologists in London 748
Bisnopsgate Church 748
Extension of University College, London 749
The Wood Paving at Ludgate-circus: A Dead Lock 749
Footway Improvements in Tottenham 749
Sale of the New Steam Ferry 749
Obituary 749
Welland Viaduct 749
New Engine Works at Leicester 749
The New Industrial Museum, Berlin 750
Porch and Belfry of the Belgian Façade: Paris Exhibition 752
London Street Architecture: Messrs. Marshall & Snelgrove's Premises, Oxford-street 752
The New Eddystone Lighthouse 755
The Dome of the Rock 755
Our Footpaths 756
The Victoria Dock Extension 756
Bridge Accident on the London and North-Western Railway 757
Worcester Diocesan Architectural and Archæological Society 757
Shropshire Archæological Society 757
Parliamentary 757
Monumental 757
Competitions 758
Brompton Oratory Competition 758
Norwood Schools Competition 758
Sanitary Matters at Derby 758
Rainfall and Sewage Irrigation 758
Re "The Fortune" Theatre, and Moorfields and Environs 758
Sir Gilbert Scott 758
The North Coast of Kent 759
The Professional Decorator 759
The End of "Jerry" Building (Perhaps) 759
Landlord and Tenant: King v. English 759
An Architect's Claim: Jameson v. The Brick and Stone Company (Limited) 759
Bridges 760
New Public Halls 760
New Markets 760
Gasworks 760
Clocks and Bells 761
Church Building News 761
Dissenting Church-Building News 762
Roman Catholic Church-Building News 762
School-Building News 762
School-Board Schools 762
Disasters 762
Decoration of St. Paul's Cathedral 762
Variorum 762
Miscellanea 762

Geometry and Optics of Ancient Architecture.

IN a recent number we gave a general description of the theory in regard to the geometry of Egyptian and Greek architecture,* which has been stated and illustrated in so elaborate a manner by Mr. John Pennethorne in his recently-published work. We will now look at his conclusions, and the method of arriving at them, a little more particularly.

The subject of Egyptian architecture and its geometrical development is only touched upon, however, so far as to break ground for the application of geometry to Greek architecture, by exhibiting traces of this application in the art from which that of the Greeks was, in great measure, undoubtedly derived. The instances given from Egyptian art and architecture in regard to the observation of fixed geometrical proportions are, therefore, very slight and unimportant, and might be passed over, except that they illustrate at the outset a tendency too readily to find what he is looking for, which seems to us to have beset the author throughout his book, and to have led him to attach weighty meanings to things which are quite possibly the result of accident, or, at all events, are easily capable of another interpretation from that which he gives them. On plate 1 we have first the reproduction of a figure given by M. Prisse d'Avennes, in his "Histoire de l'Art Égyptien," which our author describes as a "drawing of sculpture, laid down according to the Egyptian canon of Proportions, where the artist has first traced the divisions of squares in red lines and then outlined the figures in dark ink, guided by certain established proportions." Now, there is really nothing whatever in the example to indicate the existence of any such "canon." All that we see is a figure drawn on a space which is, certainly, covered with equal squares made by lines crossing at right angles, but the relation of the lines and spaces to the drawing does not appear to be upon any system, or to require any explanation more profound than that they were merely made for the purpose of copying or transferring the figure, just in the same way as a modern engraver copies a picture. The plans of excavated chambers given, the dimensions of which divide into aliquot parts each way, really show no more than what is done in modern house-planning every day: a room is made 20 ft. by 16 ft., because somewhere about those proportions are required, and as some figures must be given, it is simplest to write down measurements in round numbers. The mere existence of a measuring rule of standard length (and we must suppose the Egyptians to have possessed such things) would naturally lead to commensurate ratios in such a case. Another example is given, in which the length of the chamber equals the height and width combined, and the proportions of the three measurements are coincident with those which would result from the working out of the eleventh problem in Book III. of Euclid, "to divide a line A B into two parts at a point H, so that A B × B H = A H²." Mr. Pennethorne says,—"I give the dimensions as they were taken, for the relation between the lines can hardly have arisen from accident, and it is singular if we should find in Egypt a practical application of one of the problems of Euclid." Surely we may add that it would be very singular that people should take the trouble to illustrate such a problem in this manner, when the observation of these proportions could have no possible practical value in relation to the object of the excavation. And we must feel compelled to regard also with decided scepticism the notion that the heights and projections of the two columns from Medinet Haboo are purposely scaled according to a given modulus, as shown by Mr. Pennethorne in Plate II. When in the case of Greek and Roman orders we find the height of the column with a direct ratio to its diameter, of course it is obvious that there was an intentional proportion. But in the case of Medinet Haboo, to which temple the author seems to have given special attention, the only direct proportionate ratio that he is able to give is that in one case the whole height is divisible into fourteen parts, of which three go to the entablature and eleven to the column, and in the other case into thirteen parts, three to the entablature and ten to the column. He calls these parts *moduli*, but it must be observed that they have no relation, like the Greek modulus, to the width of the column; they are merely obtained as the measure which will divide the two principal sections of the height into similar aliquot parts. When we come to the details, which the author wishes us to believe are all regulated in relation to a fresh modulus derived from the width of the abacus, we find that no ratio can be obtained except by subdivision into smaller parts, and then we have the base = 4 parts, shaft = 33½ parts, bell of capital = 8½ parts, abacus = 4 parts; and the other column is just as irrational in its heights; the only point that seems like an intentional correspondence is that in each case the abacus and base seem to be of the same thickness. Now, with all respect to Mr. Pennethorne, we must be pardoned for saying that such a mode of procedure is as "irrational" as the results obtained from it. At this rate, all an inquirer has to do is to reduce the elevation of a design to such minute parts that you can get a common divisor for every portion of it, and then you may prove anything, to those who are willing to believe. But, in fact, the very appearance of the architecture is against the supposition. There is such a manifest refinement in the appearance of Greek architecture that one is prepared to believe in further refinements of principle; but in the case of Egyptian architecture the mere appearance of the details suggests that "it were to consider too curiously, to consider so."

We come with more expectation, therefore, of finding fact and theory in accordance, to the field of Greek architecture, which, moreover, we take to be really the *raison d'être* of the book. If the reader will take the trouble to refer to our diagram on page 686, *ante*, and the remarks accompanying it, he will see what is the theory of Greek architecture which it is Mr. Pennethorne's general object to prove: that the buildings were designed to appear to the eye in certain rational proportions of parts, and that the executed heights were modified in order to appear in the precise proportion desired when viewed from the proper point: and thus, that although the heights were designed in certain rational proportions on the geometrical elevation, or in the given measurements, the actual measurements were altered in execution in accordance with trigonometrical calculations as to the visual angles at which the various parts would be seen. The author appears to have been led to take up the theory from remarks in Greek literature, some of them in contemporary literature (Plato more particularly), some reproduced by Vitruvius as representing the known principles of Greek architects on record in his day. The investigation of the subject Mr. Pennethorne pursues by an inductive method, the object of which, in his own words, is, "First, to clear the several Athenian remains of Greek architecture of the irrational quantities that by measurement may be found to exist, and to substitute instead the nearest magnitudes which shall be found to be commensurable with one another. Secondly, to express the ratios between the commensurable magnitudes in the simplest numerical forms, instead of the actual dimensions, and then, by comparing together the several selected examples of the Doric and the Ionic orders, to ascertain, when thus cleared and reduced, whether any general and constant proportions can be discovered that may serve as a basis for the calculations that may be requisite to determine the corrections that Plato and Vitruvius allude to, when they refer to the second kind of Proportion, namely, the apparent Proportion."

In other words, the executed heights in the principal examples of Greek architecture are found to come very near to, though not quite to coincide with, the heights which would result from certain definite proportions between the height of the order and the length of the upper step, which Mr. Pennethorne appears to assume as the basis of the geometrical elevation. He

* See *Builder*, p. 685, *ante*.

therefore takes in succession the various examples and assumes that they were designed to appear in this definite or rational proportion, and then proceeds to consider whether the slight divergence from these precise proportions can be accounted for on the supposition that they were intended to correct the effect of perspective, and to give true apparent proportions when seen from the proper point of view.

We cannot undertake here to follow Mr. Pennethorne in detail through the calculations on which he bases the results which he wishes us to accept as in favour of his theory. We have gone through them with considerable care and attention, but they could hardly be made intelligible to our readers without diagrams of some elaboration. These we would have been prepared to give, very possibly, had our conviction been that the theory was one which was sound in its basis and likely to be permanently adopted as the key to the method of the Greek architects. But this we do not think. We must, therefore, refer those who feel sufficient curiosity about the subject to go into it further, to Mr. Pennethorne's book and his numerous and elaborate diagrams. We must content ourselves here with a few remarks as to the difficulties which would be involved at the outset in accepting Mr. Pennethorne's theory, and some of the features in his method of stating the argument which seem to us absolutely to require further explanation and justification before he can ask any one to accept his views as correct in detail; although we willingly admit that his statement of the subject is in itself exceedingly interesting, and likely to be very suggestive in regard to collateral questions of architectural design, even though we do not accept it as correct in the main.

In the first place, then, the supposition of a building in which the main object is to attain certain mathematically correct ratios of proportion when seen in perspective necessarily presupposes that it is to be seen from one point of sight only. From any other but the right point all the science and refinement are thrown away. So far, however, from considering this as any obstacle in the way of the acceptance of the theory, Mr. Pennethorne seems to consider it almost his strong point. He gives a very carefully-executed plan of the Acropolis and its buildings, showing the two points of sight, opposite the north-west and south-east angles respectively, from which the two designs, as he calls them, were to be seen correctly; for it must be observed that the author is so convinced of the paramount importance of this perspective adjustment in the eyes of the Greek architect, that he considers the *design* to consist in this, and speaks of the two ends of the Parthenon, which, as far as their purely architectural features are concerned, we are accustomed to regard as identical, as "two separate designs." To our thinking, the first and most obvious criticism on such a theory is, that if the Greek architects worked on this principle they wasted their time and science in a very foolish manner. To design a building so that it could only be properly seen from a certain point, or at all events to spend all their time and calculation in fitting it to be seen from that point especially, when there were hundreds of other points from which it might be looked at, and to make this optical correction in relation to the one point the central object of the architect's labours, appears to us to involve a disproportion between the means and the end too absurd to be entertained for a moment; and which the Greeks, with all their science and refinement, were far too practical to have fallen into. There is another objection to the application of this system to the Parthenon in particular (the building on which Mr. Pennethorne dwells most) which may be noticed just now. But the whole theory, as given in his pages, presents difficulties and contradictions which it seems to us impossible to get over.

In the first place, in regard to the mere question of the heights of the various portions of the order in relation to their base (the upper step), we are to understand that these heights are modified from the "given heights" (or what would be the correct proportionate heights in geometrical elevation), in order to allow for the effect of perspective; but that the horizontal measurements are never so modified, but are executed in accordance with the first given measurements. To begin with, this seems rather like a convenient suiting of the theory to the facts. The horizontal dimensions of the main portions of the building are found to have rational proportions, so that the theorist who is looking for rational proportions everywhere has no need to modify them. The heights are found to be irrational,* and therefore the theorist has to suppose them as modified, and to account logically for the modification. We are really a little edified by the *naïveté* with which the author tells us that the horizontal dimensions "are found to be" always the same as the original given measurements; as of course the real meaning of this is only that they will suit his theory on that supposition. But if we are to suppose such a refinement as the modification of dimensions in order to preserve a certain proportion to the eye in perspective, why, we must ask in the first place, should this be applied to vertical and not to horizontal dimensions? The latter are as much distorted by perspective as the former, and the correction of the distortions is as easily calculated in the one case as in the other; and as the author (as we shall see just now) assumes that the buildings were intended to be seen in an angular and not from a front or flank view, the one correction is as necessary as the other for perfecting the optical correction. However, suppose that we admit the fact that for some reason vertical proportions were optically corrected, and horizontal proportions left as first given; let us look at the results in regard to the vertical heights only, eliminating horizontal perspective altogether from the statement of the problem. On plates I. and II. of Part II. Mr. Pennethorne gives sections of the east and west porticos of the Parthenon, on the same principle as that roughly illustrated in our diagram (fig. 2, p. 686) above mentioned, showing the projection of the given heights on the section of a sphere of which the eye is the centre, and the executed heights determined by rays drawn through points on the spherical diagram till they cut the perpendicular plane on which the real elevation is executed; and he subjoins tables of the differences between the intended proportional effect and the executed heights. Now if this were the principle on which the heights in the vertical design were regulated, a glance at the diagram aforesaid will make it obvious that to a spectator viewing the building from the ground level (which is the position assumed by Mr. Pennethorne in regard to the Parthenon) the optical corrections would result in a continually increasing excess of the executed height over the proportions of the geometrical elevations, as we ascend from the base to the top of the building. Thus, if in the first given proportions the heights of column, entablature, and rise of the pediment, are to each other as 6, 2, 2; then, in order that the several parts should subtend these proportional visual angles, it would be necessary after we had fixed the apparent height of the column, to make the entablature rather more than 2, and the rise of the pediment again still more, the distortion increasing as the building rises higher from the level of the eye. But when we refer to Mr. Pennethorne's tables, in which he gives in two columns what he calls "first given quantities obtained by proportion" and "true dimensions from calculation" (the latter being supposed to be the *executed* heights), to our astonishment, we find that the differences between the calculated heights and executed heights are utterly irregular, sometimes *plus* and sometimes *minus*, instead of the differences increasing in ratio as we ascend. In the corrections of the east portico of the Parthenon, for instance, we have the following:—

	First given quantities obtained by proportion.	True dimensions from calculation.	Additions and subtractions resulting from correction.
Column	33·7788	34·2400	+ 0·456 ft. = 5·5 in.
Entablature ...	11·2596	11·1560	− 0·103 ft. = 1·2 in.
Stylobate	5·6298	5·6786	+ 0·048 ft. = 0·6 in.
Whole height..	50·668	51·074	+ 0·406 ft. = 4 8 in.
Pediment	13·136	12·454	− 0·682 ft. = 8·2 in.

The left-hand column here represents the proportional heights of the various parts as they would be first drawn in geometrical elevation, to carry out the theory of proportion of parts which Mr. Pennethorne believes to have been intended; the next column ("true dimensions") exhibits the heights as they would have to be executed in order to assume those proportions from the point of view of the spectator; and then the author refers to the actual heights of the Parthenon given on another plate to show how nearly his results coincide with the real heights obtained from measurement. So they do, and how he made them do so he knows best; but it is beyond us. Just look at the two columns of figures. The height of the column, which is to *appear* as 33·7788 ft., is increased in execution by 5·5 in. to allow for perspective distortion. The entablature, which is to bear a fixed relation to the column, both in the first given proportions and in the executed result, is *decreased* in execution; the whole height is *increased* by 4·8 in., and then the rise of the pediment, which is furthest from the eye, and therefore would require most increment to correct the effect of perspective, is *decreased* in execution by 8·2 in., and this by way of preserving in perspective its true proportionate relation to the whole height of the order, which has been *increased* in execution! Unless Mr. Pennethorne can give some explanation of this process of reasoning other than we have been able to find in his work, it is useless to say a word more on this part of the subject,—he has simply refuted himself by his own figures.

So far, the proportionate heights are considered as having a direct ratio to the actual (not apparent) length of the upper step. When we come to consider the whole building as designed to be seen from the special point of view which Mr. Pennethorne considers it to be calculated for, we come upon quite a different order of ratios, in which the proportion to be observed is between the length of the diagonal line connecting the extreme visible points of the building, and the height and proportions of the whole block as seen in perspective. It is observable that in estimating this proportion between the cubical block of the temple and its diagonal line, the author does not take the upper step as the extreme of the design, but the stylobate, the diagonal line being taken as that between the extreme angles of the stylobate.* This point of view the author regards as capable of absolute demonstration in regard to the Parthenon. He says:—

"Now that the Acropolis of Athens has been partly excavated, and we are again able to trace the original lines of road, and to follow the exact route taken by Pausanias in his ascent to the Propylea, and in his inspection of the several works of art in the interior of the Acropolis, we shall perceive that all the roads and interior platforms were so arranged by art that, at every point where a complete view could be obtained of each design, the work was presented to the eye of the spectator so as to be seen only from an angular point of view; and to suit these angular points of view Plato informs us that 'artists worked out not real proportions, but such as seem to be beautiful in their representations when seen through the view taken from a favourable point.' It is well known that the eye can only see, without moving, a limited extent of view, which may be defined by a visual angle embracing 45°, and in the plan of the Acropolis we shall see that sufficient space was left, when required, to allow of the eye taking in the whole extent of each design within the given visual angle; we thus obtain two angular views of the Parthenon, viz., a north-west and a south-east angular view."

Thus, a triangle being formed upon the diagonal line as a base, such that the base shall subtend an angle of 45°, the distance of the spectator is at once approximately fixed at this angle, and further regulated by placing him so that he shall have an equally good view of the front and flank of the building, and the whole heights and proportions are then supposed to be designed with special reference to their precise and mathematically correct conformity, as seen from this point, to a given rule of proportion. Those who wish to follow out the calculations by which the design of the building on this principle is demonstrated, we must refer to Mr. Pennethorne's pages. We cannot ourselves see any use in continuing the subject, because as we hinted above, there is one fact which, in regard to the Parthenon at least, vitiates the whole theory. This is that, as every one knows, the designs of the two fronts and flanks are identical, except as regards the sculpture, and some slight irregularity of level at the angles (which, however, neither Mr. Penrose nor Mr. Pennethorne considers to be connected with optical correction), while the ground on which the spectator must stand to be in the right position for the two angular views is about 10 ft. higher at one end than at the other; and it is thus obvious that the calculations in regard to the visual angles which apply to one end of the building cannot apply to the other. Mr. Pennethorne by no means overlooks this; on the contrary, he has a special explanation of it. Most of our readers will remember that there is an irregu-

* It may be necessary just to observe, that we are here using the words "rational" and "irrational," as Mr. Pennethorne uses them, in their literal Latin sense, as meaning that which has, or has not, a definite "ratio" of quantity or measurement.

* But, in spite of this, he proposes (p. 56) to consider the temple in perspective as "a solid bounded by planes containing the *middle step* and the fascia above the corona"; so that here is a third datum. Such a confusion of method in itself shows the artificial nature of the theory, and the difficulty there is in getting it into anything approaching a consistent form.

larity in the platform on which the Parthenon stands, and that at the east end it projects somewhat further beyond the line of steps than at the west end. This is the author's solution of the difficulty. By thus projecting the platform of the building at the east end, a longer diagonal is obtained, and the spectator's position is thus thrown further off, and by that means the proportions which were suitable to the view from the lower level at the north-west angle are rendered equally suitable to the higher level of the spectator at the south-east angle. So that the spectator's whole appreciation of the refinement of proportion of the design from this point of view depends upon his directing his attention, not to the diagonal proportions of the main building, but to the extension at one end of the platform on which it rests! Certainly, we think the Greek architects, if they have got a presentation copy of Mr. Pennethorne's book sent across Styx to them, must pray to be saved from the friends who expound them in this fashion. All we will say is, those may believe it who can. To our thinking, nothing could more strikingly show the futility of the attempt to evolve a consistent theory of the kind which Mr. Pennethorne has spent (unfortunately, as we think) so much trouble and pains over, than the shifts to which he is obliged to have recourse to make it even appear to fit into a consistent whole. Our own scepticism, in turning over this part at least of his book, "grows by what it feeds on," and we cannot but think the author has been tempted into expending a great deal of ingenuity on a shadow, by giving a too literal and precise interpretation to the passages of Plato and Vitruvius, which he repeatedly quotes in support of his views. The passage which he quotes (p. 52) from the latter, to the effect that it is the part of the architect to adapt his symmetry and magnitudes to the nature of the position, and, "by diminutions and additions, to qualify the symmetry till it appears rightly adjusted," does not really appear necessarily to imply anything more than such adjustment of details to their position, as every architect who designed with care and judgment ought to make. We may very reasonably suppose that the Greek architects gave more consideration to this, and carried it out more systematically, than has ever been done since; but that they bestowed such an amount of calculation upon the unsatisfactory result of producing a building which could only be seen rightly from one point of view, and split hairs over refinements which would have, even then, to be rather taken on trust than seen by the eye, Mr. Pennethorne has not convinced us, and we should think the conclusion very little creditable to the practical sense which was as much a characteristic of the Greek mind as its æsthetic refinement.

We have used the word "unfortunately" in regard to the extent of study and pains which have been given to this part of the subject of Mr. Pennethorne's book, but it must be understood that we only applied that adverb to the particular portion of his treatise of which we have been speaking, and which, though including what is obviously intended as the central point of his work, is by no means the whole of it. Taking the book as a whole, its production is an occurrence quite the reverse of unfortunate, although we must consider the main point in it as "not proven." And even in regard to this portion, although we cannot for one moment entertain the idea of buildings being designed for a special point of observation (which would, in fact, reduce architecture to a kind of scene-painter's art), we may say that the subject of the modification of designs in execution from their original proportions in the geometrical drawing is so important to a certain extent, and has been so much neglected in modern architecture, that the discussion of the subject, even in a manner involving some erroneous conclusions, may be useful in drawing attention to it, and leading to some practical results from it in modern building. Other chapters, on the application of the conic section curves to the details of Greek architecture, on the proportion and design of the columns, on the Egyptian origin of Greek ornaments, and on the design of Roman buildings and their details as compared with those of the Greeks, are of great interest, and too much praise cannot be bestowed on the profuse and elaborate nature of the illustrations which are given in every part of the book, many of which are exceedingly useful and valuable diagrams to have by one, even independently of the text which they illustrate. Among many illustrations which we cannot here even refer to, is one to which we direct attention, because it is very curious as a record of an ascertained fact, and because of the question which it suggests in regard to Egyptian architecture: this is the diagram (plate 1, part iii.) of the plan of the roof of the inner court of Medinet Haboo, showing the lines of the cornice both internally and externally as curved inwards with a horizontal deviation from the straight line, so as to present a convex line towards the court, and a concave line externally. The deviation is 4½ in. on the longer sides (104 ft.), and 8½ in. on the other two sides (80 ft.). It is no doubt highly interesting to find such curves in such a position, for if on testing other examples of Egyptian architecture similar curves were found in what have been hitherto accepted as straight lines, our ideas of the most ancient of existing styles might unquestionably be very much modified, and the curved lines of Greek architecture would receive a new illustration in regard to their origin. Only we should put a note of interrogation to the idea of accepting this instance as a decisive proof that the Egyptians consciously practised such a correction. It would have been far more conclusive to us if the lines had been convex towards both the exterior and interior, as in that case they would in each instance have corrected a tendency to hollowness in the line exactly similar to that which led to the vertical entasis of the Greek column. But the hollow exterior line, it appears to us, would have only exaggerated a tendency to hollowness in the centre of each face when viewed in perspective; and we are disposed to think that it is quite possible that the curve is the result of a tendency of the colonnade to settle inwards in the lapse of time, while the angles are, of course, confined from doing this by their mutual buttressing. This idea certainly receives colour from the fact that Mr. Pennethorne himself, in the course of these early studies, discovered by measurement a horizontal "sag" inwards in the architrave of one of the faces of the Parthenon, which Mr. Penrose in his subsequent observations showed conclusively to be the result of displacement, as Mr. Pennethorne admits in the present work. The point is worth notice, because it is very possible that owing to the appearance of this book, and other causes, increased attention will be given to the study of optical curves in ancient architecture, and it is as well that any investigators who take up the subject should be on their guard as to the possibility of horizontal displacements in buildings which have stood for many ages, such as may lead to entirely erroneous conclusions as to the methods of the original builders.

Whatever our opinion as to some of the theories put forth, and the conclusions deduced from them, we cannot but feel that a hearty vote of thanks is due to an author who has been at the trouble of laying before the architectural world his ideas upon subjects so full of interest, in so elaborate and sumptuous a work, which must no doubt be, like virtue, its own reward to its industrious and indefatigable author; and most of those who go through it will probably be able to echo on their own part the sentiment with which the author concludes his introductory chapter:—"If I have been led into errors, I have had my reward in the study of much which is beautiful in art, in geometry, and in nature."

House Rents and Wages in America.—While landlords and owners of real estate are feeling poor from inability to obtain such high rents as formerly, it must be remembered (says the *Boston Post*) that the loss is comparative. Prices of almost everything else have also largely depreciated. Moreover, tenants constitute a very large majority in cities and large towns. If the poor and middling-interest classes can obtain cheaper rents, so much the better for those on whom the stringency bears most heavily. Again, Boston is not the only city where the depreciation in rents and prices of real estate is felt. From a late statement of the *Baltimore American*, it appears that house-rents in the "Monumental City" are lower than before the war. Real estate is said to be cheaper than at any time within twenty or thirty years. There, as here, one prominent cause of low prices is the large number of sales made, and in the market to satisfy mortgages. Houses that rented a few years ago for $1,100 per annum can now be had for half that sum. The same is true in New York, Philadelphia, and all Western and Southern cities. The shrinkage in prices is a universal fact.

IS THE HEALTH OF EAST LONDON WORTH ATTENTION?

WITH the heat, and with much of the true charm, of an old-fashioned July, unmistakable indications of a holiday season of unusual activity are setting in. The subject is one of no small interest in a sanitary point of view. It is our wish not to swell the chorus of remarks which are likely to issue from the press, as to the charm of a summer holiday, the propriety of enjoying one, the best localities to select for the purpose, and the like; but to look a little deeper into the causes of a phenomenon which is, year by year, assuming a greater social and financial importance.

Apart, then, from the questions of fashion, of habit, or of caprice, what is the main cause which has led to so signal a change in the notion of what is necessary for the proper enjoyment of the summer as that which has occurred within the memory of those who are by no means very old men? We do not speak so much of the need felt by persons who pass a busy or a sedentary life in a great city or town, of a respite, in which to fill their lungs with pure air, and to look,—for a few bright and precious days,—at the fair face of nature. We refer rather to the imperative necessity which most well-to-do persons now annually find press on them for a change of locality in "the season," however salubrious may be their homes. And yet when we come to search for the main cause,—apart from any question of diversion of the mind from the daily routine,—we shall find it to be much the same everywhere. The same influence which urges great and small to a summer emigration,—apart from the minor causes to which we have referred,—is due to the constantly increasing density of population, and the corresponding increase of pressure on the elements of sanitary welfare.

Of course, it is in the great centres of population that the pressure is most severely felt. But it must be remembered that throughout England the population has doubled within the lifetime of men who are not what we call extremely aged, and this general duplication has been intensified in certain spots,—London doubling its population within forty years, and certain new centres of activity, such as Wolverton, Crewe, or Birkenhead, increasing at a much more rapid rate. The average density of England and Wales is 384 souls per square mile. But in Middlesex the density rises to 680, and in London to 25,666 souls per square mile, or, in the most densely-populated parts of London, to 40 inhabitants per acre.

In the neighbourhood of many towns there is no doubt that the air itself becomes so laden with the products of respiration and of combustion, that the lungs may be severely affected, at all events, in the case of the younger and feebler members of society, and that the need of inspiring a purer air may at times be felt to be absolute. This increasing pressure, indeed, to a great extent has wrought its own relief. The merchants and larger tradesmen who formerly took a pride in adorning the City abodes in which their childhood had been passed, now enjoy their suburban villas, and come to London daily by railway. In the central parts of London the density of population,—at all events, in the night,—has much decreased, and cannot be said to be on the increase. But the more we simplify the local problems, the more we complicate the general problem. Where for so many acres of densely-populated towns we substitute four or five times the area of less densely, but still somewhat thickly-inhabited country, we are not diminishing the total pressure on what we may call the sanitary elasticity of the country. And it is not the human chimney alone,—the consumption of pure air in the process of respiration,—that has to be borne in mind; nor is it the domestic consumption of carbon, and the canopy of gloom, with descending "blacks," that invades places not long since pure, and bright, and genuine country, that has to be regarded. The increase of luxury and of comfort has led to the introduction in great numbers through the country of novel manufactories, paper works, cork works, biscuit works, factories of all sizes and kinds, each of which may be a source, not only of private, but of national wealth; but the unchecked emanations from which are, in constantly increasing numbers, poisoning both the air and the water of England.

Thus then it happens, not only when the member of Parliament whose sessional work is

over goes down to his county or borough, or when the merchant, or tradesman, or professional man, takes his dearly prized yearly holiday, that the nooks and corners of England in which he was accustomed to find occupation for his rod, or his gun, or his butterfly net, or his botanist's case, are sensibly becoming, year by year, less attractive; at the same time that the residents and neighbours of the country towns which, in years past, attracted holiday-makers or home tourists, are themselves added to the number of emigrants. In many cases, indeed, this change is to a certain extent self-supporting. Thus the owner of a villa in or near some bright country town must have his annual month or two by the sea,—but he lets his own house meanwhile. In point of fact, it is not unfrequently the case that, under the rule of fashion or of caprice, a family will leave a thoroughly healthy, convenient, charming house, and pack themselves into comparatively wretched lodgings,—thus insuring a "change of air" which is anything but a change for the better. So much the worse for them. But so much the better not only for the seaside lodging-house keeper, who lives on the fruit of that summer migration, but for the inhabitant of the city who finds change and health in the country home from which the owner has,—we often must think very foolishly,—fled.

As to this, however, all that the medical man, the sanitary reformer, or the public writer can do, is to call attention to the facts,—and to point out how often the form is followed at the cost of the essence, and the idea of change is dissociated from the fact of advantage. But with regard to the original cause of all this movement,—so far as it is tangible, there is something more to be said. The pressure on our elements of public health is yearly becoming more severe. We have spoken of the air. It is, however, on the water that the most injury is inflicted,—and as to this, there is enough going on, day by day to give rise to the most serious disquietude.

This is no new theme. Commission after Commission has reported as to the pollution of our rivers and streams. Slowly and reluctantly the Legislature has been led to condemn practices which,—under the Common Law of England, as it was administered in the time of Elizabeth,—would have brought prompt and condign punishment on the perpetrators. We have sometimes felt serious doubt how far the Rivers Pollution Act was really a step in advance. That doubt, held with modest hesitation, because it involved a legal question, has lately been repeated and enforced by competent judges; that is to say, by eminent barristers. It is the opinion of some men who are entitled to be regarded as authorities that the chief effect of the Rivers Pollution Act has been obstructive: that in stating certain offences, and providing penalties for them, in certain modes, it condoned very much which, by the old Common Law of England, would have been summarily punished. But the hitch lay here,—who was to go to the cost and labour of invoking the law? We fear that that hitch has been only very slightly amended,—if, indeed, it prove at all to have diminished.

The difficulty lies here, as we have before pointed out. The enforcement of the law is a disagreeable duty. Private individuals usually shun it. The new public authorities are shy on the subject. They think it is well to let sleeping dogs lie. They are afraid of retaliation. Thus it happens that the Rivers Pollution Act is but of doubtful utility; and that the destruction of the waters of the country by manufacturing and domestic refuse is proceeding at a rate which is certainly full of menace for the salubrity of large districts of England.

The difficulty found in the enforcement of laws which are chiefly of public benefit,—not giving to individuals, as a rule, advantages for which they find it worth their while to litigate,—was met, in old times, by the useful but ignominious functions of the common informer. Into the question of the morality of that mode of administration it is not necessary now to enter. But what has hitherto not received due attention is this. There exist, throughout the country, numerous authorised authorities who are clothed with a considerable amount of power, and from whom the country have the right to expect the fulfilment of a duty that is yearly becoming of more importance. We should be glad to see a Governmental inspection of rivers and streams, if it tended to keep them pure. We could even pay,—if with small respect,—a punctual commission to the public informer, if in no other way could we detect the practices which are injurious to our streams. But, in the mean time, what are the conservators about?

There are thirty places, lying in fourteen counties, to which Commissions of Sewers have been directed under the 23rd of Henry VIII., cap. 5. The oldest date of the outstanding Commission in any of these cases is Oct. 3, 1837, for the Rape of Arundel. There are twelve places, lying in seven counties, to which Commissions of Sewers have been directed under the 24th & 25th of Victoria, cap. 133, part I. Of these the earliest date of recommendation by the Enclosure Commissioners to the Home Office is February 24, 1862; and the latest is April 6, 1871. Under Part II. of the same Act have been constituted no fewer than 190 drainage districts of various magnitudes. A recent return to an address of the House of Commons, dated 9th April, 1878, gives a short description of the area embraced in each district, the county in which it is situated, the year, chapter, and date of the local Act, the name or titles of the authority, and the name and address of the clerk or secretary. This useful return, which was moved for by Mr. Arthur Peel, can be obtained of Messrs. Hansard for the modest price of 3d., and we commend it to the consideration of those of our readers who take interest in the salubrity of our waters.

At the same time, it should be borne in mind,—and the reflection is anything but satisfactory,—that the attempts of the most important of all these 232 Conservancy Boards and Commissions to carry out one main feature of their duty are at this moment receiving the most determined opposition from another local body, which was originally called into existence for a purpose closely akin to the objects, or at least a part of the objects, of the appointment of the Conservancy boards. By section 58 of the Act cited (the Land Drainage Act of 1861, 24 and 25 Victoria, cap. 133) penalties are imposed on persons who cause to flow, into any of the waters administered by the Commissioners, any unclean or polluting liquid. Thus, although the main objects of the protection of banks and channels, the regulation of outfalls, and the supply of water for irrigation, may be regarded as the primary objects of the Commissions issued in virtue of the law, it is clear that their duty is to be taken as in harmony with the more recent enactment of 1876 (The Rivers Pollution Prevention Act, 39 and 40 Victoria, cap. 75), under which it is an offence to carry into any stream any solid matter so as to interfere with its due flow, or to pollute its waters; a proscription which we shall see repeated in various Acts of Parliament. These wise and essential provisions, the enforcement of which is thus clearly enounced as forming a part of the duty of River Conservators and Commissioners, are even more pointedly expressed in some of the special Acts of Parliament contemplating the discharge of Conservancy functions. Thus by the Thames Navigation Act of 1866 (29 and 30 Victoria, cap. 89) which vests in the Conservators of the River Thames the conservancy of that river from Staines to Cricklade, the Conservators are bound to "cause the surface of the River Thames to be (as far as is reasonably practical) effectually scavenged, in order to the removal therefrom of substances liable to putrefaction." By section 63 persons are prohibited from opening into the Thames within the district above defined any new sewer or drain, or allowing any fresh supply of polluted liquid to pass through such new sewer. By clauses 64, 65, and 66, power is given to the Conservators to compel the discontinuance of existing sewerage works which pollute the river. By the Thames Conservancy Act of 1857 (20 and 21 Victoria, cap. 147), which incorporates the Conservators, penalties are imposed on the discharge of any ballast into the Thames, or for unloading, putting, or throwing into any part of the Thames, or on any shore or ground below high-water mark of the river, any rubbish, earth, ashes, dirt, mud, soil, or other matter, or allowing any offensive matter to flow into the Thames.

It is thus clear that, from 1857 to 1866, the Legislature has consistently endeavoured to arrest the degradation of the banks, the choking of the courses, or the fouling of the water of any English river or stream; and notably and expressly so in the case of our chief river, on which depends so much of the health and prosperity of the metropolis. At the same time (in view, no doubt, of the long neglect of all persons concerned to enforce penalties for obstruction or pollution of rivers) a certain time was given, with power to the Commissioners to enlarge it, for effecting the discontinuance of nuisances existing at the date of the passing of the several Acts of Parliament. In 1864 a second Thames Conservancy Act was passed, amending the principal Act; and in this, while the technical offence of throwing obstructive matter into the river is extended to its banks and tributaries within three miles, there is a clause imposing penalties for suffering any washing or other offensive substance produced in making or supplying gas, *or any other offensive matter*, to flow or pass into the river Thames. This Act refers to the Thames from Staines to the termination of the river proper, at Yantlet-creek, where the jurisdiction of the Conservators terminates.

It was in 1858, when the offensive condition of the Thames through London itself caused such well-founded fear of pestilence, that the Metropolitan Board of Works was empowered to carry out works "for the improvement of the main drainage of the metropolis, and for preventing, as far as may be practicable, the sewage of the metropolis from passing into the Thames within the metropolis." This was a step in advance; although admittedly only a part of a general scheme for the restoration of the purity of the Thames. The Public Health Act of 1875 (38 and 39 Vict., c. 55) expressly declared that nothing in its enactments should authorise any local authority to make or use any sewer, drain, or outfall, for the purpose of conveying sewage or filthy water into any natural stream or watercourse, or into any canal, pond, or lake," until it is "freed from all excrementitious or other foul or noxious matter." Any local authority was empowered, with the sanction of the Attorney-General, by clause 69 of that Act, to take proceedings to prevent pollutions of streams. This provision brings the local authorities under a degree of responsibility very similar to that of the conservators and commissioners of rivers and of drainage. Nuisances are defined by clause 91, and the provisions of the Act are declared not to affect other remedies.

Against, or rather in mitigation of, this effective body of legislation, comes Clause 19 of the Rivers Pollution Prevention Act of 1876. "Where any local authority, or any urban or sanitary authority, has been empowered or required by any Act of Parliament to carry any sewage into the sea, or any tidal water, nothing done by such authority in pursuance of such enactment shall be deemed to be an offence against this Act." Such a saving clause, for temporary reasons, was no doubt essential. But this clause must be taken with Clause 16, which declares that the provisions of the Act shall not affect other remedies. In Clause 18 the powers of the Thames Conservators, of the Lea Conservators, and of the Metropolitan Board of Works, are exempted from the operations of the Act. As to the intentions of the Legislature, the Act, which thus expressly leaves the settlement of this question as to the discontinuance of nuisances thrown into the Thames below Staines in abeyance, must be read together with Clause 92 of the Lea Conservancy Act, with Clause 64 of the Thames Conservancy Act of 1864, with Clause 102 of the Thames Conservancy Act of 1857, with Clause 3 of the River Pollution Prevention Act of 1876, and with Clause 69 of the Public Health Act of 1875. All these clauses concur. Omitting legal phraseology, what the law says is this:—Pollution of rivers, by sewage or otherwise, shall be put a stop to. But reasonable time shall be given to public bodies who have already been authorised to commence works, which at present are imperfect as failing to purify their effluent water. Not a hint is given in any Act of Parliament that any exemption from this duty can be otherwise than temporary.

In fact, it is only necessary to turn to the provisions of the Metropolis Management Act of 1855 to see that disinfection of the sewage was contemplated as part of the authorised scheme. The Metropolitan Board of Works was authorised by Clause 135 to cause the sewage and refuse from such sewers to be sold or disposed of as they see fit, *but so as not to create a nuisance*, and the money arising thereby shall be applied towards defraying the expenses of such Board. In a treatise on the law relating to the Pollution and Obstruction of Rivers (by Clement Higgins, M.A., Barrister-at-Law, published last year), p. 169, it is stated as the ruling in the case "Attorney-General *v.* Metropolitan Board: "Neither is the Board authorised by this section to turn into a navigable river or

stream the sewage of an entire district, so as to create a nuisance." It was held that an action would lie against the Metropolitan Board for the injury of premises by works executed by the Board, under their powers. On March 14th, 1865, a report on the main drainage of London was presented by Joseph William Bazalgette, C.E., to the Institution of Civil Engineers, and was debated by that body for four evenings. In this debate, Mr. G. W. Hemans "thought there was reason for congratulation . . . . that the whole of the sewage, north and south, was concentrated at two distinct points, so that it would be handed over to other parties for the purposes of utilisation. *The re-distribution and utilisation of sewage formed a natural consequence of the main drainage.*" Mr. Bidder remarked, "It must not be forgotten that in bringing the whole of the drainage to Crossness, or to any other point on the side of the river, it had been brought where it could be dealt with. At present, it was thrown into the river in such a way as to be obnoxious, and difficult to manage." "The laws of this country were all that could be desired with regard to the protection of rivers: the only difficulty was to put these laws into operation." Mr. Bazalgette stated, in reply, that the sewage "if made to flow down to some low district, as had been done, and concentrated at a point where it could be conveyed with very little lifting, or by gravitation, over agricultural land, and at the same time to a point where it would cease to be a nuisance to the metropolis, he thought that was the cheapest and best arrangement which could be entered into." And at the end of his speech, Mr. Bazalgette justified the "granting the sewage to a company for the period of fifty years," on the ground that this company were about to expend 2,000,000*l.* of money, and to benefit the ratepayers of the metropolis, who were not called on to expend one penny in this great utilisation scheme.

There is only one outcome of the evidence, to which we have directed the attention of our readers, which avoids the stultification of the legislature, and the charge on the Metropolitan Board of Works that they obtained powers under false pretences. For not only have we the formal statement of the engineer as to his object in concentrating the sewage at Crossness; and the admission on the part of all men of eminence in the profession that its discharge raw into the Thames was an inadmissible nuisance; but we find an arrangement for the disposal of the sewage sanctioned by the very Act which constituted the Board of Works.

The outcome of evidence, then, which respect for Parliament, respect for the Metropolitan Board of Works, and respect for the character of their engineer, render the only one that is not offensive, is this. No one dreamed, in 1855 or in 1865, that the Thames was to be excepted from the general protection which the common law had always given, and which statutes had rendered, in certain cases, more ready of enforcement, for the protection of English rivers. No one dreamed that costly works, authorised for the "preventing, as far as may be practicable, the sewage of the metropolis from passing into the River Thames within the metropolis," were authorised by Parliament with the intent that the sewage of London should be permanently discharged into the river, in a crude state, at points whence a portion of it returns with flood-tide far above bridge, or, indeed, into any part of the estuary. Powers were taken for the immediate relief of the most pressing danger; contemplating the abolition not only of that, but of all sources of danger, and giving to the Metropolitan Board of Works, without fixing the limit of toleration, the same kind of consideration which the whole concurrent *corpus* of legislation on the subject declared should be discretionally given to public bodies who were struggling with the difficulty of the open question—how best permanently to deal with sewage.

To contend that the whole course of recent sanitary discovery and sanitary legislation is to be ignored in the one case in which the largest population is concentrated on the smallest area in the kingdom, is to raise a kind of argument which courtesy finds it difficult to characterise. That the conservators of the Thames are bound by the responsibilities of their charge to inquire into the steps which the Metropolitan Board of Works are proposing, in order to complete their statutory duty of keeping the sewage of London out of the river within the limits of the metropolis, and of so dealing with it as to avoid nuisance, we hold that no impartial and well-instructed person can deny. That their representations should be met, as they have been met, not by a request for further time, but by a plain denial that any duty was left unfulfilled, or any nuisance committed, is one of those pleas in the teeth of all proved facts which rarely prove of ultimate advantage to those who offer them. We have taken some trouble to examine, item by item, the replies given by the engineer of the Metropolitan Board to the report of Capt. Calver. We have no space now to enter on this subject, and can only say that it is a matter of deep regret, not so much for the mischief of the individual case as for the discredit thrown on public institutions, to see the spirit and the tone in which the remonstrances of the rightful guardians of the river have been met. One thing we can show very clearly, time and space being fit, and that is, that if the recent report to the Metropolitan Board of Works be accepted as correct, two results will follow,—one, that all the sanitary legislation of the last twenty years has been entirely mistaken and mischievous; the other, that the metropolitan drainage system is in course of rapid silting up. We hope to take occasion to put these outcomes of Sir J. Bazalgette's statement beyond the possibility of contradiction. In the mean time we only have to put the broad question,—Is the sanitary condition of the river Thames below Staines, that of the riparian population, of the people employed at the docks, and of those concerned in the shipping, a subject which the Legislature has ever contemplated as being left exposed to the unabated nuisance of the permanent discharge of the crude sewage of four millions of people, at two points of concentration, into the river, for three hours per tide?

SOME THINGS WHICH INTEREST US AT THE PARIS EXHIBITION.

ON the Paris or eastern side of the fountains and waterfall that divide the Trocadéro gardens, there is not much to interest the sanitarian, unless we descend to the banks of the Seine. On this side of the Trocadéro will be found the aquarium, which will scarcely impress Englishmen who are familiar with the rich collection of fish exhibited at Brighton. The exhibition of the Woods and Forests is more peculiar. Here are samples of all the work done in the forests of France; the wooden spoons the foresters carve, and the traditional wooden sabot which in French caricature is as emblematic of the proletaire as the gend'arme's heeled boot of Imperialism. By the side of these trophies are models and plans demonstrating how fierce, reckless, mountain torrents have been drilled and disciplined and subdued into running along smoothly through an artificial canal, so that, instead of cutting rocks in two, occcasioning landslips, destroying the verdure and trees, these erratic watercourses are converted into mountain irrigators, which greatly enhance the value of the surrounding timber. But the contrast given of certain torrents in their wild state, and in what we might term their present cultivated condition is scarcely calculated to satisfy the artist and the lover of nature. In the one case we have a magnificent landscape, alive with numerous waterfalls; in the other, bricks, and stonework, and walls, and smooth water, and trees each at a given distance from its neighbours, standing in rows like so many soldiers in the drill-yard waiting for inspection.

Behind this exhibit are various wooden structures; the one is devoted to the artificial germination of seeds in glass cases, procured by heat, atmosphere, and gases supplied in given quantities, so that the seeds may grow independently of all external circumstances. Another hut contains entomological specimens; on the whole, a somewhat poor collection, if compared to what has been done at the Exhibition in other matters; and there is also a little kiosque containing meteorological instruments. These, however, were not yet in working order. Finally, we reach the Algerian pavilion, surrounded by an Algerian village. On this spot there is an indescribable clatter of voices; the Algerian waiters of the rival *cafés* invoking visitors in a variety of languages to partake of the syrup of dates, the cétral syrup, or else to accept some araki. The latter liquor, tasting like pure absinthe mixed with a few drops of syrup, and flavoured with aniseed, is a treacherous concoction, which should only be taken with precaution and not drunk in the broiling heat or after great fatigue. In the Algerian pavilion it will be seen that the eucalyptus is, at last, receiving the cultivation it merits. There are many samples of this the most beneficent of all trees, as also of preparations made from its leaves; notably a powder and some cigarettes. These latter are being prescribed for bronchial affections, and doubtless the smoke has also a disinfecting influence. In all cases, it is most refreshing to inhale the odour of the eucalyptus-leaves after the fatigue of visiting the Exhibition; and when we consider the mischief this tree can dissipate, the miasmatic influences it so effectually neutralises, we feel in its presence the sublime poetry of nature expressed by its bounteous harmony in supplying the remedy with the evil, leaving it only to our intelligence to avail ourselves of the one to neutralise the other. Thus districts which formerly none dare approach may now be planted with the eucalyptus, the unhealthy emanations feeding the tree, and the tree, in its turn, not only purifies the air, but supplies us with magnificent timber, and with leaves that contain valuable medicinal properties. Nature rarely gives us a more beautiful lesson; and we are glad that its teaching was not forgotten at the Paris Exhibition.

Turning westward, and leaving these miscellaneous exhibits, we once more approach the bridge. Before crossing over the Quai Billy will be found the exhibit of the Union Céramique et Chaufonnière de France. Here there is a great variety of bricks, of perforated bricks, of tiles, piping, brick flooring, revolving hardware cowls, &c.; but though these samples are interesting from a commercial point of view, we failed to notice anything very new. Some more samples of this description can be found on the other side of the Trocadéro building, between the right wing and the Avenue du Trocadéro. It will be remembered that we examined some more French hardware at the very opposite extremity of the Exhibition, that is to say, just opposite the École Militaire, at the end of the Champ de Mars. In consequence of this gross mismanagement, it would be impossible to view in rapid succession, and compare the various specimens of French bricks and hardware used for building purposes, unless we possessed seven-leagued boots.

On the other side of the Quai Billy, but before crossing the Pont d'Jéna, and running parallel with the Seine, are the important exhibits of the Génie Civil, the Travaux Publiques, &c., comprised in Class 66. Unfortunately, and though we have visited this section repeatedly, we failed, as a rule, to find any attendants able to explain the various exhibits. We were generally advised to call on the firms themselves, though these are situated in all parts of the town, and some of them in the suburbs, not to mention the provincial exhibitors; but if this be really the only method of obtaining information, we are tempted to inquire what can be the good of an exhibition? The full benefit of a stove or a warming apparatus cannot be appreciated by the mere contemplation of a certain number of iron pipes, or the exterior of a brick or enamelled oven. Thus, on entering the building devoted to class 66, objects displayed by the celebrated firm of Messrs. Geneste, Hersher, & Co. were the first to attract our attention. These gentlemen have been entrusted with the ventilation of the great hall of the Trocadéro Palace, of the new Hôtel de Ville, and that of many other buildings of great public interest. The wheel which, in its revolutions, sets the air in motion is here exhibited, together with many plans and drawings, but till these gentlemen choose to leave some documentary record of the systems they employ or depute some competent person to attend and give explanations, we must refrain from noticing their all-important exhibit. Again, we find another exhibitor, M. C. Pétiaux, Architecte de Travaux Publiques, who offers to travel any distance, second class, and without claiming any fee, so as to demonstrate how his system will preserve any public or private building from the ingress of damp or injurious gases; but we have not the slightest hint given us as to what is the nature of the system he proposes to employ. There are, however, many other systems and materials exhibited here for keeping out damp, and, in fact, for rendering houses air-tight,—a result which cannot be contemplated with unmingled satisfaction. M. Jaccoux, for instance, conceives that he has secured comfort and health for his customers by supplying some special wadding which shall fit with such perfection the chinks of the doors and windows

that no emanations, no damp, can ever enter inhabited houses. Unfortunately, and especially in French houses, the unwholesome gases are generated within perhaps more than without, and with persons who do not understand the importance of ventilation, a draughty door or window may save the health of the family. The cements, the waddings, the gutta-percha fittings, the registers for chimneys, all present grave dangers where sanitary science is ignored; for they prevent the accidental ventilation which so often replaces, more or less effectually, the absence of proper and regulated methods for exhausting foul and supplying fresh air. While, therefore, thoroughly approving the attempt to prevent unpleasant draughts, and the more useful endeavours to keep out damp, we feel ourselves bound to protest that these measures, if unattended with additional means of ventilation, may cause graver dangers than those which they obviate. Among these contrivances, Messrs. L. Caron & Dupuis's water-tight plasters are well worth examining. They are not mixed with oil, and there is, therefore, no action created by the admixture of grease with the saline humidity resulting from the plaster. The Préservatif Leo, as it is called, has the power of resisting acids and the salts of ammonia, and can, therefore, be used with advantage in stables. The Société des Enduits hydrofuges, of Gasny (Eure), have patents also based on the repudiation of linseed or olive oil as the foundation of paint. These oils only borrow from the colours, with which they are mixed, their preservative qualities, whilst the plasters in question are stated to possess a preservative character quite independently of the colours.

Whether this is so or not, no opportunity was afforded of judging. Unfortunately many French exhibitors imagine that it is only necessary to issue a fulsome prospectus, detailing all the advantages of their exhibits. No chemical details are given in proof of their assertions. There is no testimony from independent authorities on the subject. The public, and even critics, are expected to repose blind faith in the assertions of a commercial circular. Under such circumstances, French exhibitors do not do justice to themselves, and will, we fear, be neglected, at least by foreign visitors, who would otherwise take the greatest interest and pains in the study of their inventions.

Messrs. J. Bigot-Renaux, of Rouen, have understood better and entered more fully into the spirit of an exhibition. Their patent joint for water-pipes is exhibited, with water at hand, to test its efficiency, and an attendant to explain the system. This is as simple as it is effective. It consists in allowing one joint to come over the other. A roll of very superior gutta-percha is placed between the two, and tightly jammed by means of a fastening attached to the rims of the pipes. This joint is not only watertight; but, if the level of the roof or wall gives, the elastic allows the piping to bend at the joints without admitting any escape of water. The first experiments of this system were made by Messrs. Mackintosh & Co., in 1847, and subsequently by Mr. Thomas Wickstead, C.E., in London, when it was proved that gutta-percha joints could support very high pressure, and cost 22 per cent. less than lead soldering. The system was largely employed in Germany, and now the 12,000 mètres of cast-iron water-conduits that run over the roofs of the Paris Exhibition are joined together by J. Bigot-Renaux's patent.

The walls of this, the Class 66, are ornamented with drawings of great interest, and might form the subject of very interesting lectures on sanitary engineering, &c. Among others, we noticed plans for the distribution of water to the town of Rouen; other plans for improving the water supply of large towns, and drawings of the submarine tunnel between England and France. The model, also, of a cheap house, six stories high, was especially interesting, as it is a fac-simile of houses that have actually been built. No details were, however, given relating to the water supply, and we were not a little surprised to find that there was but one closet for every three families, and that it was situated next to one of the three kitchens! Outside the building, and facing the Seine, but resting against the walls of the Annexe, will be found a large number of patent closets and night-stools. Here Messrs. Rogier & Mathes, of Paris, exhibit some of the genuine French closets, which, disgusting as they undoubtedly are, may nevertheless be preferred, from a sanitary point of view, to the imperfect and filthily-kept imitations of the English system. Indeed, this section is one of the least creditable to France as a nation. There are some signs of dawning knowledge,—some patentees have sought to make air-tight traps; but others have boldly sent models which have been denounced and condemned over and over again as most pernicious to public health. Decidedly, specialists and foreign organs of scientific and public opinion ought not to lose any opportunity of protesting against the barbaric uncleanliness, indifference, and ignorance still prevailing in France with regard to the dangers of sewer gas, and as to the necessity of cleanliness in respect to these matters. It is strange that a nation so brilliantly gifted, and in advance of many of its neighbours, should still linger on the verge of barbarism when dealing with some all-important and fundamental sanitary questions.

CYPRUS ISLAND AND ITS ANTIQUE ART.

So much has been said and written on the one absorbing subject of the "War in the East," and those engaged in it, that it would seem to be all but impossible to add a fresh word to it. For months has it been absorbing public attention in almost all kinds of ways; but, with all this, but very little or nothing has been dwelt on appertaining to even the *present* state and human condition of the disputants in their peculiar modes of life and special surroundings; still less so on the state of their art and fine art, if there be any such, *now* and in *past* days. But now that things are so nearly or quite settled, those comparatively unobtrusive matters will and must come more and more into view, and we shall long to know a something clear and definite about the ways of life and the *art* of such places as Cyprus, which has, as it would seem, by a sudden decree of fate, come into our English hands, and is to be in time, we must presume, made English, and changed and turned from East to West. What *that* will be must be left to the future, and we should hardly dare to speculate about it; but what it is now, confining ourselves here to things artistic, would be a very curious matter, indeed, to find out fully and clearly, and to get a glimpse, at least, of how the *present* in such a place has grown out of the *past*, and what that past was. It is a magnificent chance, and it will be a pity if it be not taken advantage of, and some lessons drawn from it.

How much there is yet to be done in and with matters in these out-of-the-way regions it would indeed be hard to estimate, for the general and whole-world tendency now is to level all things, and to repeat in one place what has been done and is doing in another and a more conspicuous one. Cyprus is sufficiently out of the way, as things are, but in the future it must become in the way, and the present inhabitants of it, who live, as it would seem, pretty much like gipsies, will be as much astonished at our advent in their island as would the antique inhabitants of it have been in the days of Japhet, and when it was called Chittim, of Old Testament renown. Its "antique" days are most surely numbered. We need not tell its history; the Phœnicians,—those yet mysterious people, who travelled so far, and into so many places,—were among its first settlers, probably, as in so many other cases, driving out before them a yet more primitive race. Colonies afterwards came into it from Greece, and to one of its heroes was attributed the "invention" of the hammer, the anvil, and the tools used to this day even in metal working. It must needs have been invaded, too, by Asiatic colonies; but what,—history, and tradition, and fable put aside for the moment,—is certain is the indelible impression on the art-remains found in it, sometimes deeply buried in the earth, of the archaic Greek methods of work and art-feeling. Its history at one time is certainly buried yet deeply in its soil.

It is quite impossible, then, to glance at any authentic object from this small but world-famous island, without being struck by its Greek or Etruscan,—to use that convenient but most uncertain word,—spirit; or, if the term be better and more descriptive, and more scientific and exact, and nearer, its archaic Greek feeling and character. The early Greeks most certainly found their way into it, and worked in it, and have left us records of what they then did,—evidences of their art-power and skill. It would be curious, and not a little instructive, to know, with anything like certainty, for how long in Cyprus this archaic-Greek mode of doing art-work, and this style of work, lasted, and the precise date of it. We have but little indeed to guide us here. It is the work itself only that can and must be studied, and we would hope that the opportunity will not be lost of diligent inquiry and research now that this island of Cyprus has passed into our careful keeping, and before it is too much disturbed by "modernisings" and "improvements." We here more specially refer to the archaic Greek history of the island, and to its antique Greek remains. In the cities and towns, and in out-of-the-way places, there yet remain vast undiscovered stores of antiquities which might throw some light on the disputed origin of the Greek idea of art, individualised as it was in the old world, and yet is.

It would thus be not a little instructive to see if possible a little more clearly than we now do into the origin of Greek art, and into the beginnings of it when in its very rudest state. Here and there, may be, as in some few objects in the British Museum, we really do so, and there have been found objects in this very island of Cyprus which the rudest and the most primitive of Greeks might certainly have been the authors of. There is far more chance of getting at such in a sea-surrounded island, and in a colony, than in Greece herself, for the very absence of notice and the positive neglect in such localities insure their preservation. No one heeds them. We do not positively assert there is this treasury of antique art, but it is worth a little painstaking and research to look for it before the chance is lost, and while the matter would doubtless enlist a good deal of antiquarian, if not public sympathy and support. The time is hardly arrived, perhaps, for a full appreciation of the importance and art value of a complete historic series of any particular phase of art, but it would be not a little interesting and to the purpose to prepare the way for it, and to help to provide the materials for it. The fact of the probable increase of the antiquity department in the British Museum, by the migration of the Natural History Section to South Kensington, all but invites it.

There is, too, here, even in the few specimens of pottery we have been able to closely examine, evidence of a fact which will, some day or other, though it may be distant, be thought worth the looking into here in this island: it is the difference to be found in the drawing and work of the individual workmen who have executed and "ornamented" the cups, and plates, and vases. This difference, by not a few accomplished antiquaries and art-writers, has been attributed to differences in style and date; but the difference and distinction may really lie in the distinct art capacities and powers of design and drawing in the individual workmen. Each workman, however rude he may have been, has worked as an artist; just, indeed, as much so as any one of our Royal Academicians in the painting of an oil picture. So that not only is any certain given subject differently treated, and differently "designed" and put together, but the handwork of each workman is distinct, and evidences an ever new capacity,—no two men ever producing a precisely like result. Our belief is, that some startling evidences of this will yet come to light, and that a careful search in Cyprus Island would, in all probability, prove it: the more particularly if care be taken to keep the several "finds" together, each locality furnishing evidences of individualised work, though the style of art would be the same. We do not see how this can be well doubted.

Another singular fact in old-world history may here find confirmation, viz., the travelling propensities of the men of old days; for we see here amidst these remains evidences of the workmanship of the Egyptian and Assyrian artist-workmen, evidently done on the spot, and by those coming from Egypt or Assyria, and working in their own national way, and with but little, if any, reference to the art about them. In the old world, with its isolated ways of work, and with its simple ideas undisturbed by foreign influences, its very weakness made its strength, for the whole power and art skill and inventiveness of each national workman, whether Greek, or Egyptian, or Assyrian, lay in his narrow—if you will,—and single, and individualised style of art. He never dreamed of copying: he worked with the means and ways of his own country, and time, and style of art, and applied all readily without effort to all things coming under his special art-trade or

vocation. And this is the glory and strength of the old world's fine art, and the pride of its artists and workmen. A slow process, may be, and a narrow one, but a quite sure one, and thoroughly national in each case, and truly and visibly representative of the times in which each such artist lived. Whether rude and rough in his work, or learned and refined, the true national art expression was always there.

Our main object in thus looking hastily at what there now is of antiquity in Cyprus, is to call attention to how much more there probably is still buried, not only underground, but put away in out-of-the-way spots, which have been but little, if at all, in these days visited; and to urge on those who have the power not to lose the opportunity which our occupation of it will offer for further and more thorough search. We feel quite sure of the result, and that it would repay the trouble and expense. We have the more particularly, it is true, dwelt on the *antique* days of Cyprus, but have not forgotten its more recent history, and the advent into it of a race of men, the Turkish, who, we fear, in the general excitement have been a little forgotten. The Turk is still an occupant in Cyprus, and rules there to a certain extent; and his mosques must form a very striking feature, architecturally, in the aspect of the towns and cities, and even small villages. But slender justice has been done, perhaps, to the architectural and art capacities of the Turk,—all things, as always with the unfortunate and unhappy, go against him. But for all this he knows how to build and how to work artistically and nationally, and he most surely lives in a capital city without rival in the world for its natural and built-up "picturesqueness." No wonder that they from the cold North look with such longing and eager gaze at its fast-barred gates!

THE MICROPHONE.

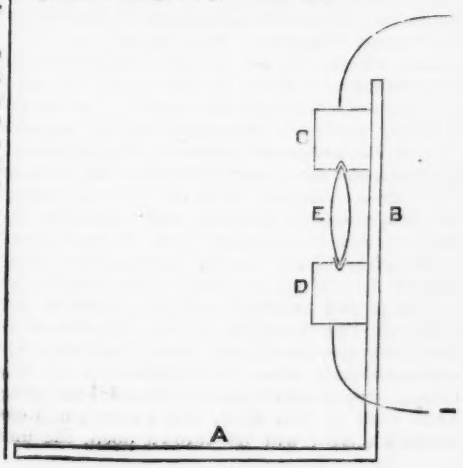
THE microphone, the latest wonder in the sphere of acoustics, is not an independent machine: it is a supplementary apparatus to the telephone. Before proceeding, therefore, with the description of the first-named instrument, we may recall to mind the construction of the latter. In the telephone, a magnet is enveloped in wire, and opposite to one of its poles stands an iron plate capable of vibration. If electric currents pass through the wire in quick succession, the magnetism of the magnetic rod is changed by each of these currents and the iron plate more or less strongly attracted, *i.e.*, it vibrates, the number and force of the vibrations corresponding to the number and force of the electric currents.

In ordinary telephoning, the electric currents with which the work is effected are produced by a second telephone, in which the sound-waves cause directly vibrations of the iron plate, and thereby changes of the magnetism, and thus indirectly electric, recorded currents. This has the advantage of the electric currents corresponding very exactly to the modifications of the vibrations of sound; but this disadvantage, that they are extremely weak. Soon after the invention of the telephone, therefore, it was endeavoured so to change the instrument as to make it fit for working with more powerful battery currents, and it was hoped to render it practicable for very great distances. Most, if not all, of these constructions have, up to the present time, not been very successful ones (but this difficulty may yet be overcome); one, however, although it has not led to the desired end, has produced curious lateral results, one of which is the microphone, with which it is our object to deal.

In order to understand the principle of the apparatus, the following should be known. A galvanic battery possesses, opened or closed, a certain "electro-motive power,"—that is to say, a certain force which separates the two electricities. When opened, *i.e.*, if its poles end freely and unconnectedly in the air, this power shows itself by filling the one pole with a certain amount of positive, the other with an equal quantum of negative electricity. When closed,—*i.e.*, if its two poles are connected by a wire,—the positive electricity flows away from the positive, the negative from the negative end; the electro-motive power, however, continues to transport new electricities to the two poles, their flow is unceasingly kept up, and a continuous stream of the two electricities through the wire is created, and this flow is the electric or galvanic current. Its volume depends upon the electro-motive force; the greater the latter is, the more electricity is transported to the poles, and the more flows through the wire. But it depends also upon something else. All the parts through which the current passes oppose to it a certain resistance; it is as if electricity could move in the wires and in the other conductors only with a certain amount of friction. The strength of the current is the smaller, the greater the resistance. The exact relation between the volumes here to be considered were first recognised by the late Professor Ohm, of Berlin; the law known by his name, which since 1827 has become the foundation of the whole science of galvanism, runs as follows:—"The strength of the current is equal to the electro-motive power of the battery, divided by the resistance of the whole conduit." If a given battery is used each time, its electro-motive power is a given unchangeable volume; if the resistance, for instance, is made three times stronger, the current becomes three times weaker, and *vice versâ*.

Now, the resistance of the wire is the greater the longer and thinner it is. If the current is conducted through a wire that may be shortened (for instance, by dipping it into quicksilver, or by winding it round a metal cylinder), at each shortening the current gets stronger in a certain proportion, at each lengthening it becomes weaker. Resistance is especially great in places where two metallic pieces touch each other loosely. This is very easy to understand, for contact is imperfect, and electricity finds only few points where it may pass from one metallic body to another. If, therefore, a place is provided in the conduit where a current passes through two conductors only loosely in contact with each other, it is considerably weakened, and if the two conductors are pressed firmly upon each other, a perceptible increase of the current is soon created.

Let us now suppose a battery-current having such a loose point of contact connected with a telegraph. This might be effected in the following simple manner. One battery-wire is fastened to the wire-coil of a telephone, and thence conducted to a metallic plate; the other battery-wire is secured to any metallic object of a suitable weight, say, an ordinary iron nail, and this laid on the plate. The current passes, but it is weak, because it meets with great resistance at the point of transit from the nail to the plate. Its next effect is, that it imparts to the magnet of the telephone a certain permanent magnetism, of which we may assume (the contrary would cause no essential difference) that it is equal to the magnetism which the magnet possessed originally. The iron plate of the telephone is consequently attracted with a certain magnetic force, and is permanently maintained in any position. If pressure is exerted on the nail, the contact with the plate is increased, the resistance becomes less, the current stronger, and in consequence the magnet is more powerfully magnetised: the iron plate is attracted more strongly. If the plate is touched, a momentarily better contact is effected by the push, consequently a momentary attraction of the plate; the telephone clatters at the same time as the nail. Hughes, the inventor of the type-printing telegraph, made this experiment, at first in a simple manner, with two nails touching each other; he then perfected it, and thus became the inventor of the remarkably sensitive instrument to which he has given the name of microphone. It is so simple that anybody can make it by means of two small pieces of wood and three pieces of charcoal. The diagram below represents its principal features.



Two small boards, taken by Hughes originally from a cigar-box, are fixed to each other rectangularly; one (*a*) lies horizontally upon the table, the other is fixed vertically to the horizontal one. Two small blocks of charcoal (*c* and *d*) are glued on to *b*; their size is immaterial. The upper one has a small semicircular indentation on its lower, the lower one on its upper side, and in these indentations a small charcoal rod (*e*), pointed at both ends, is inserted. From the charcoal blocks *c* and *d*, two wires, the one direct, the other through a telephone, lead to an electric battery, which for wires of a moderate length may be very weak; a Daniell element is more than sufficient.

The little rod, on account of the holes in which it stands, cannot fall out, touching the blocks of charcoal only loosely; the current, consequently, that passes through the telephone is weak while the apparatus is at rest, as already pointed out. If it is shaken, the little rod vibrates between the two fixed blocks of charcoal, touches them more firmly, and the current becomes stronger in consequence of the decreased resistance, the plate of the telephone moving audibly. Now, the apparatus is so sensitive that it is not necessary to touch it in order to produce such a movement in the telephone, a sound-wave being sufficient to cause such an effect. Especially if a sound-source, for instance a musical-box, is placed on the plate *a*, the apparatus acts like a sounding-board; all its parts, consequently also the movable charcoal rod, participate in the vibrations of the musical-box, each vibration causes an increase of the current, and thereby a vibration of the telephone; in other words, the telephone reproduces all the sounds produced on plate *a*, and if it is held to the ear, the music of the musical-box is heard quite plainly.

The charcoal in question is the hard, sonorous cake made of charcoal-dust which, known as retort coal or Bunsen coal, is used generally for galvanic elements. Hughes describes it as the best of the simple materials in use, because it does not burn nor is liable to rust, and furnishes a loose contact. But it may be improved by heating it to a red-heat, and then suddenly plunging it into quicksilver. Its numerous pores become quickly filled with small balls of quicksilver, and if the system is disturbed, not only does one piece of coal touch the other, but the small beads of quicksilver approach more closely to each other, and touch each other better, so that they also contribute to increasing the strength of the current.

Thus prepared, the instrument is so highly sensitive as to be able to perform for the ear what the microscope does for the eye: it brings to us sounds which the ear unarmed cannot perceive; on that account it has been named "microphone." If a watch is put on the wooden plate, its ticking is heard quite plainly in a telephone half a mile off. If an insect is put on it in a box, the sound of its tread is heard, and it is possible to distinguish the comparatively heavier step of a humble-bee from the lighter touch of the fly. The instrument as now constructed reproduces especially well sudden, clattering, and sonorous sounds; sounds of less strength and the human voice are reproduced only as a confused noise. But it only requires a glance at the form of the apparatus described to convince ourselves that no great exactness can yet be expected from such a primitive tool, and that there is a vast range for improvement. The latest invention by Hughes opens up to science pure and simple a vista of diving into and listening successfully in many regions where hitherto everything that passed was to us shrouded in silence. Whether it will prove of benefit to the practical sciences, future researches will show.

A Parochial Dispute.—The old Guardian Board of Clerkenwell, to whom College House, Highgate, belongs, has threatened legal proceedings against the Holborn Union for taking illegal possession of the ground. College House was, prior to the amalgamation of the parishes, one of the workhouses of the parish of Clerkenwell, but after that event it was handed over to the Union. The Union is now building on the site an infirmary, which will cost nearly 150,000*l.*, and, for the purpose of erecting a laundry, College House is ordered to be pulled down. The Clerkenwell Board is stated to have defied the Union to take such a step without their consent; but the latter have resolved to proceed with the demolition of the old building at once.

HARROGATE.

Or origin "humble and obscure," Harrogate has acquired fame. It was once an undistinguished part of the great forest of the barony of Knaresborough, but if even it had been known to the Romans, as some have conjectured, it was down to two centuries ago a mere site of scattered huts of "humble husbandmen." To Captain William Slingsby, of Scriven, it owes the first recognition of the virtues of its waters, which gradually built up its fame. In the seventeenth and eighteenth centuries, the "mineral waters near Knaresborough" became more fully recognised; and gradually, divided by invisible lines, two villages,—High and Low Harrogate,—grew up in different parishes, and under different ecclesiastical jurisdictions. Baths began to be formed, hotels to be built, and places of recreation to be constructed; the wells were enclosed; "pump-rooms" built, and eventually Harrogate became the nucleus of the fashionable health-resort we know. Before the commencement of the railway era it was "considered the principal watering-place in the North of England," and it was estimated that under the disadvantages of coach-traffic, its visitors numbered annually 10,000. At that time it was a resort for the gentry and clergy; it abounded with academies and schools; had half a dozen boarding-houses and ten hotels; there were promenade-rooms and a "reading society," baths, spas, and places of worship; but manufactures were nearly at their present low ebb,—a linen manufacturer and a bleacher comprising the bulk. These were the days of coaches; and the "Telegraph" ran from Leeds to Newcastle, with the "Hero," the "Red Rover," and the "Times"; the "Royal Mail" ran from Shields; the "Union" to Ripon, and the "Courier," and others of these old-world modes of communication crossed in their routes at the fashionable watering-place. The population in this early day of the development of Harrogate was small,—some 2,000 or 3,000, and its growth was then slow. When the Leeds Northern line was opened, and partial railway facilities gained to the rising watering-place by the opening of a station at Starbeck, there was an impulse received which, since the acquisition of a more direct and nearer route, has been accelerated, and now Harrogate is undergoing all the changes which towns in the second stage of growth know.

It has already acquired not only many of the institutions of towns, and to these it has added some of those which are the special addenda to town life; and the state of some of these show tolerably plainly the growth of the town. It boasts of cottage and bath hospitals, furnishing accommodation for scores of patients; its Board of Improvement Commissioners is just getting fairly into its arduous duties; a police force of forty-six persons constitutes the guardians of the division in which it forms the most important part. It possesses now a dozen churches and other places of worship; whilst its pump-rooms, rinks, and lounges minister as fully to the world. It is becoming a large postal centre: in summer about 10,000 letters and papers are daily received and sent, and in winter the number shrinks to about one-half. A staff of six execute postal duties, and about a dozen, telegraphic; but those numbers both contract slightly in the winter. The enumeration of its residents or visitors; the tabulation of its trades, or its facilities of comfort, or its attractions; the numbers either of its poor or its police,—would do little to describe this notable watering-place. Its large, roomy, and convenient hotels must be visited to be appreciated; its public buildings must be seen to have their architectural beauties fully known; and its charms of sun, and shade, and spray must be experienced instead of being told. To the great towns of the south of Yorkshire it is becoming more and more an indispensable resort, for to it the merchants and toilers of Leeds, Bradford, and more distant places, resort,—to reside, to stay the month or six days that constitute their various holidays, according to position and length of purse.

The fact that it has, so to speak, a very wide gathering-ground, gives to Harrogate a certainty of extensive usefulness as a health resort. Except Ilkley, in the one direction, which is small, and very different in the nature of its attractions, and the seaside resorts, which are distant, there are no competitors in the district to which the well-to-do, who like "sun and sulphur" can resort; and as there is, around and within a reasonable distance from it, a very large population, to which it is the "lungs,"—the great summer breathing-space. This population is attracted to it by its known repute, that certainties a varied company, of entertainment as varied, and of pleasant scenery and pure air. Basing its claims to the patronage of the public on these, Harrogate has added to its natural charms something of moment in the past, but in recent years it has not done so much, being content to rest on its oars. But the fame it has acquired will not allow it to stand still, and thus it is now in what may be called the second era of growth, its outskirts being now ragged with the buildings that are encroaching thereon and that are spreading out the town, just as aforetime the two branches that form it now spread themselves out towards one another. But whilst there is this material growth known just now, and that growth is of the most real and abiding character, depending in considerable degree on the residential attractions Harrogate presents, yet there is not now to the full such a sowing of seed as there should be to ensure a continuance of the growth in the future. There does not appear to be in Harrogate sufficient of the corporate public-spiritedness which there ought to be, and without which continued growth is rendered uncertain. It has the natural advantages of pure air and beautiful surroundings; it has given itself many of the essentials that are needed by such health-resorts, and as a consequence it has now reaped fame and enjoys the reward thereof; but it needs to keep pace with other places yearly brought nearer to its visitors by better railway competition, and therefore more enabled to enter into competition with it for them. In the race for this great summer and autumnal visiting traffic, there is a continual need for the towns entering into it to add to their attractions, and to adapt these in some degree to the varying dictates of dame Fashion. Harrogate needs to bear this in mind, and if it would apply it, it need not fear for its future, assured in Poe's words, "that evil things, in shape of sorrow," shall not "assail its monarch's high estate."

WORKS IN EDINBURGH.

ANOTHER step has been taken towards the restoration of St. Giles's Cathedral. Plans have been prepared by Mr. William Hay, architect, for the incorporation of the south transept with the restored chancel, and these have met with the approval of the Town Council. The transept, which, since the division of the cathedral into three churches, has been designated the "Old Kirk," was one of the charges abolished by Act of Parliament, about fifteen years ago, and has for a few years past been occupied by the Trinity College congregation, whose place of worship had been acquired and demolished by the North British Railway Company for the extension of their station. This congregation having now obtained possession of a new church erected for them, leaves the old kirk vacant and at the disposal of the authorities. In its present aspect the south transept of St. Giles's is anything but attractive, being encumbered with heavy galleries and unsightly crowded pews. Incorporated with the old kirk there is a chapel, called the Preston aisle, which is separated from the chancel by stone partitions built up between the bays, three in number. These partitions are to be removed, and the space fitted up with oak benches, similar to those in the chancel. To the east of the transept, and beyond the south aisle of the chancel, is situated a chapel, designated Montrose Aisle, beneath which lie the remains of the "Great Marquis." This chapel has been used as a vestry for the old kirk, and the spaces between the piers built up. The piers and stone vaulting are intact, and all that requires to be done for restoring the chapel to its original character is to remove the obstructions between the piers, so that it may be open to the chancel. The Preston aisle, which is to be incorporated with the chancel, is to be screened off from the transept by a wood screen, 35 ft. in length, provided with folding doors, and having open tracery in the upper stage. The remaining portion of the transept is to be offered to the Order of the Knights of the Thistle as a chapter-house, the Order having had no such accommodation since the destruction of the Chapel Royal at Holyrood. Should the Order avail itself of this offer, the transept and its western chapel will be thrown open, the unsightly pews and galleries removed, and a throne for the sovereign and canopied stalls for the knights substituted. In the restored chancel a powerful organ, blown by hydraulic power, has been placed, so that this part of the cathedral may now be considered complete as to its fittings. What with stained glass, reredos, organ, and other additions, a great transformation has taken place in the scene of Jenny Geddes's attack upon "black prelacy," but, as showing that her spirit still survives, a reverend Doctor of Divinity, and a member of the School Board withal, has thrown out hints to the City arabs that it would be a meritorious act to smash the painted windows. But the schoolmaster is abroad in a different direction from that in which the Reverend Doctor would have.

As to the Cathedral of St. Mary, the windows of the nave are now being glazed, those of the southern clearstory are filled in with coloured glass with the heraldic devices of the donors, and the remainder with tinted cathedral glass. A paper war has been raging as to the question of letting part of the sittings in the cathedral. It appears that by the will of the testatrix she provided that the clergy were to be paid from the proceeds of the seat-letting; but it is contended that to appropriate the seats of a cathedral is contrary to precedent, and unseemly and unadvisable. The question remains behind, from what source are the clergy to be paid?

Two new established churches are in progress. The first of these, at Parkside-place, St. Leonard's, is approaching completion. The design has been prepared by Messrs. Lessels & Son, architects, and is an adaptation of Early Scottish Gothic. It measures 82 ft. in length by 56 ft. in breadth, exclusive of a projecting recess for an organ 17 ft. by 26 ft. Behind this recess is situated the vestry and a large class-room.

The interior is to be fitted up with galleries, and will afford accommodation for a congregation of about 1,000. The cost, exclusive of site, is about 6,750*l*.

A prominent feature of the design is a tower and spire at the north-west angle, which rise to a height of 120 ft. The exterior presents a rather gaunt and unpleasing aspect, devoid of expression or force of character, which might have been given even with the means at command. Severity is one thing, want of expression another.

The other church, which is in progress, is situated at Mayfield, near the entrance to the Craigmiller Blind Asylum, and is designed by Messrs. Hardy & Wright, architects, in the Thirteenth Century style of Gothic. The building is to consist of nave, aisles, and transepts. The arcading of the nave is to rest on stone shafts, with moulded caps and bases. The roof is to be of framed trusses, and a gallery is to be thrown over the vestibule at the end of the nave. The interior is to accommodate a congregation of 850, to which fifty additional may be obtained by utilising the aisles. The design embraces a tower and spire, which are not to be gone on with in the meantime. The estimated cost of the building is about 5,200*l*.

The Mayfield Free Church is approaching completion. It is Early Pointed in style, with somewhat of a French character, and consists of nave and transepts, with a recess at the east end for the pulpit, which has somewhat the semblance of a chancel. This recess is lighted by windows about 6 in. broad and about 15 ft. high, which are more singular than beautiful. There are some good points about the building, however, particularly the treatment of the flanks of the transepts, in which the architect has not been afraid to allow blank wall space.

The Clockmill property, which abutted upon the Queen's Park to the east of the palace of Holyrood, has been acquired by Government, and the high walls surrounding it removed. This addition to the park, consisting of upwards of six acres, and having some fine trees upon it, adds greatly to the amenity of the neighbourhood. This ground, which formed an encroachment upon the natural boundary of the park, had been acquired by a private speculator, with the view of erecting lofty workmen's houses upon it, a calamity from which the city has been saved by the exertions of the Cockburn Association.*

In connexion with the City improvements, and to improve the communication between Bristo-street and Nicholson-square, the unsightly garden

* The Cockburn Association takes its name from the late Lord Cockburn, who took a warm interest in the amenity of the city, and wrote a pamphlet upon "The Best Way to Destroy the Beauty of Edinburgh."

in the centre of the square has been slightly curtailed, the dilapidated parapet and railing superseded by new and handsome ones, and the garden itself laid out in an attractive manner.

West Princes-street-gardens, too, are undergoing considerable improvement. A new terrace-walk has been formed with broad flights of stone steps at each end, which have stone balusters and piers on each side. A bequest of 1,500*l.* has been left by Mrs. Ross (the widow of the gentleman who presented a fountain to these gardens) for the erection of a covered rock garden, a structure in regard to which the Cockburn Association remarks that, however interesting it may be in itself, it could not be erected on any prominent part of the gardens without detracting from their amenity. "The charm of the gardens consists in their presenting in the midst of the city a considerable expanse of greensward ornamented by trees, and capable of further ornamentation by means of flowers, which, if judiciously laid out and sufficiently protected, will form a delightful promenade for the citizens, and will continue one of the most ornamental features of the city so long as it is preserved, as far as possible, from the intrusion of erections of every description."

The effect of the handsome new terrace erected to the north of the Bank of Scotland can now be fairly appreciated, for although it looks raw and new as contrasted with the surroundings, it will soon acquire tone, and the dignity it lends to the Bank building will be enhanced.

The new Canongate school is approaching completion; at first it was stated that the estimates received amounted to nearly 600*l.* below the probable estimate, but now the School Board complain that additional calls are being made upon them. The building, as we formerly stated, is designed by Mr. William Beattie in the Scot-Flemish style, and accommodation is provided for 800 pupils, at a cost of about 7,500*l.*

OPENING OF THE "EMPRESS" BRIDGE, INDUS VALLEY STATE RAILWAY.

SOME thirteen years ago Mr. Brunton, C.E., made the first survey of the 500 miles which are between Mooltan and Kotri, with a view of connecting them by a line of railway, and ever since then a devoted band of engineers has been struggling to bring to a completion a work which, unhampered, they would have finished easily in three years; as it is, although of all the projects which the Government of India has undertaken of late years, it is perhaps the most self-evidently important, yet, according to local authorities, it has been the one most of all "muddled and meddled" with, surveyed and re-surveyed, and starved financially, till the line had become wellnigh a byeword. Now the railway down the valley of the Indus is practically completed, and a selected few have witnessed the formal opening by Sir Andrew Clarke, R.E., of the bridge across the Sutlej river, which joins for the first time the Punjaub to the Bhawalpur State.

We learn that the bridge consists of sixteen spans, each of 250 ft. clear. The foundations of the abutments and piers are all alike, each consisting of three wells, in a line, about 19 ft. in diameter, with deodar timber curbs, and sunk to a depth of 100 ft. below low-water level. The internal space is filled with alternate layers of hydraulic concrete and sand, saturated with water up to within 3 ft. of low-water level, while this 3 ft. is filled up with solid masonry. Externally, the wells are cylindrical from the curb up to 10 ft. below low-water, from which point the centre wells are corbelled out to a square, and the outer wells are similarly corbelled on their inner sides only. The masonry throughout consists of hard-burnt 10-in. bricks, whole ones only being used for the cylindrical part of the wells. Additional stability is obtained by the presence of twelve vertical iron tie-rods inserted equidistantly in the masonry, and running up from the curb, to which they are clamped, being connected at every 16 ft. in height by bottle-nuts 6 in. long. The spaces between the wells are filled with concrete for 5 ft. below low water. The stratum consists of sand entirely for the first seven piers, starting from the Adamwahan side, for the next three piers averaging two-thirds sand and one clay, while the last seven piers are, or were, fully two-thirds of their length in clay soil. The protection between each abutment pier and the one next to it consists of a pear-shaped mass of from 3½ to 4 lakhs of cubic feet of stone, designed to prevent any undercutting by the river. The centre-line of this mass is occupied by a curtain of block-wells, 9 ft. square and 30 ft. deep. The river-piers are protected by masses of stone round them varying from ¾ lakh to 1¼ lakh, the larger quantities having been used wherever the river attacked the wells before their completion. The top of this protection has in no place sunk, as yet, lower than 25 ft. below low-water level, although between some piers where the bed is clay the river has scoured down to 56 ft. The beds of both spans at which this depth was attained are floored with brick cubes for a thickness of from 5 ft. to 10 ft., to admit of the girders being erected on stages over the deep stream. The piers are finished with a corbelled and weathered cornice, open on the sides between the corbels to admit air and light to the bearing gear of the girders. The iron superstructure, which was sent out from England, complete for erection, was executed by Messrs. Westwood, Baillie, & Co., and Messrs. Head, Wrightson, & Co., and credit is said to be due to both these firms not only for the workmanship displayed, but equally for the care taken, which landed at Adamwahan this huge mass, about 6,500 tons, complete and ready to erect without so much as one nut or one screw wanting. The bridge was wholly designed by Mr. Molesworth, C.E., the details being worked out by Mr. Randell, C.E., and may be generally described as a species of lattice-girder bridge.

The mean rail-level is about 60 ft. above low-water level. Owing to the badness of the rails sent out from England, the permanent way with expansion joints has not been laid, and the road is temporarily laid on longitudinal sleepers and uniformly secured by coach-screws. The river is at present virtually confined to two spans of the bridge at its south end, but in 1876 the stream cut its channel laterally southward and ran for half a mile along the east side of the south approach embankment (which was only saved from being undercut by heavy stone protection) and raised a sand-bank nearly as high as an average flood. A breakwater is now in progress from the left bank, which is faced for two miles with 13 in. side brick cubes to the amount of from 200 to 500 cubic feet per foot run, according to the depth of water in front. Its head is protected heavily with stone, and the entire bund will be 4 ft. higher than any known flood, and furnished with a line of rail to enable additional protection to be promptly launched if ever found necessary. Two canals, each 150 ft. wide, cut across the south bank, will draw off surplus flood-water and relieve the pressure on the bund. The stations on the new line have, at the upper end, been constructed with domed roofs to the rooms, which, though not unsightly, have not, we understand, proved a success; the domes do not produce the coolness anticipated, and they are too heavy for the kucha-pucca masonry of the walls; Shujabad station-house fell bodily down from the floods last year, and is being rebuilt with a flat roof.

At the opening in June last, Sir Andrew Clarke read a gracious telegraphic message received from her Majesty the Queen, in which she thanked the Government of India for their congratulations to her on the completion of so grand a work, and signified her wish that the bridge should be named "The Empress." Sir Andrew afterwards made an address, in the course of which he said,—"Great and interesting as have been the difficulties which have been overcome by the attention and care of Mr. Rayne, Mr. Galwey, Mr. Heenan, who fell on the field of his work, Mr. Graham, and others who have been employed here, if I do not note them all, let them not fancy their names or labours are forgotten. These things are known to most of us here present to-day, and have been described to our visitors; I mean the difficulties in constructing the foundations of this bridge, and in raising the superstructure; perhaps even still more interesting, and certainly no less perplexing, was the task of training and curbing the river itself, so as to induce it to abandon its vagaries and wanderings and keep in the way it should go. Without doubt one of the most remarkable features of the fabric itself has been the sinking and founding of the wells. To us engineers here in India, this system of founding the buttresses or piers over which the roadway is to pass, is well known, and it is commonly said that we have learned the practice in this country, having adapted and adopted it from the native engineers of India. I am myself under the impression that it has been stated under competent authority that this system of dropping hollow cylinders into the heart of treacherous soil owes its birth to an inventive genius of a date long anterior to any application of it in this country, and hence that it cannot be said to be of pure Indian origin. Be this as it may, however, it must be admitted that whatever was its source, it is in India that we have learnt the value of the principle, that our application of it has met with marked success so far, and that one of the novel and remarkable features of this fabric, I repeat, is the great depth to which in the bed of the Sutlej the engineers have had to sink their piers. If I remember right, all are down some 100 ft. below the natural, or what should be the natural, bed of this wandering river, and I cannot leave this part of my theme without mentioning with honour the name of one of ourselves, a French engineer, who has been associated with us in this particular work, and to whose skill and inventive genius it is due that we have been able to accomplish the sinking of the wells with less difficulty, and with much economy of time and money. For though our roving, never-stay-at-home river,—a very Bohemian in his nature, and a second Ariel in his eccentricities,—loves soft-lying, still his bed is in places hard, and was intractable to deal with, until Mr. Gatmell invented a machine which I commend to the attention of those who have not seen it, which is as simple as it is original, and which has removed the hard and gnarled lumps that have been met with in the mattress of the Sutlej. Another feature in the practical erection of this bridge, and one which furnishes, I suspect, exceptional experience, is the rapidity with which the iron superstructure has been put in place. To have lifted on to the piers these girders, weighing tons upon tons, and clinched with thousands of rivets, would be in itself a feat of which any man who had organised the arrangements might justly be proud. But when you view the site on which he had to work, and call to mind that, at the very moment of Mr. Bell's supreme agony, when the last of his water-spans was being lifted into place, our Ariel river suddenly took it into its eccentric head or bosom, or what you will, to do what it had never done before in the memory of the oldest inhabitant,—if an old inhabitant ever survives in Adamwahan,—and at that very particular time of year came down in flood, and threatened the whole of the staging and appliances by which the girders were being adjusted. When you remember all this, you will, I am sure, agree with me in attributing the success with which the river was defeated to the pluck, skill, and energy of Mr. Bell and his assistants, and to the men, both European and native, who, confiding in their leader, worked with willing hearts and hands to beat the enemy."

Mr. Rayne, replying for the staff, said:—"I have mentioned the name of Mr. Baxter amongst Mr. Bell's small staff of Assistant Engineers. Mr. Baxter was always called upon when a more than usually difficult piece of work had to be undertaken, especially if it required tact and good judgment in dealing with native contractors or work-people. Modest and diffident of his own powers, his usual reply when thus called upon was to the effect that he did not think 'he could do it'; urged further, he would say he 'would try'; and when Mr. Baxter said he would try, no more was needed; it was sure to be done and done well. To Mr. Baxter fell the construction of the great spur on the other flank and the temporary pile bridges which, thanks to the floods, he had to rebuild three times this season. Messrs. Tait & Moyle are two other valuable young officers who have rendered Mr. Bell excellent help. They were in charge of the well-sinking till it was finished, and since then between them, they have had the putting up of the whole of the girders. These young officers do great credit to the Royal Engineering College, where they were trained. I have been surprised and delighted at the facility with which they have fallen into the ways of working here, in India, with the natives, and the practical, thorough, and devoted way in which they have buckled to their work. Mr. MacMerny, sub-engineer, put in the piled stages across the deep river in 55 ft. of rapid water, and put up all the other timber stages throughout the bridge, in addition to his other duties as foreman of the saw-mills and carpenters' and carriage-building shops. Mr. Winmill, sub-engineer, had charge of the machine-shops and of all the steam-

engines and locomotives, but was always ready, as he was often, like the others, called upon to undertake any other duty in times of emergency. Mr. Macpherson, sub-engineer, had charge of all the riveting work of the girders, and how well the work was done is proved by the excellent results yielded under the official inspection tests. Mr. Bewell, supervisor, and Mr. Da Silva and Mr. Rex, well-sinker and girder erector, did excellent service, as did many more, both native and European, foremen belonging to the works establishment. Nor will I fail to mention how well and satisfactorily on the whole the skilled native workmen have done their duty. The handling, erecting, and riveting of the large masses of iron in these girders is no light work; nor could many of the men have had to deal with anything of the same magnitude before, but that they had latterly become wonderfully proficient at it may be judged from the fact that the last of the spans, a mass of ironwork weighing nearly 400 tons, was put together and bolted up in its place on the piers in forty-five working-hours. One hears complaints of native workpeople, of their slowness, idleness, pusillanimity, &c., but I have not found them particularly amenable to these charges, and certainly not when properly led and managed, nor, I think, has Mr. Bell. Certainly, the workmen who have put up the 6,400 tons of iron composing the Empress Bridge girders cannot be very conspicuous for these failings. As regards the last, indeed, their reckless bravery, sometimes amounting to fool-hardiness, and perhaps arising from ignorance of danger, that would be apparent to most European workmen, has led to several unfortunate accidents during the progress of the works, and has always been a source of some disquietude to Mr. Bell and myself. I must not omit to mention on this occasion the services of some of Mr. Bell's predecessors in charge of the Empress Bridge who, to my regret, are not here to-day, Mr. Graham, to whom fell the duty of laying the first foundations and starting the well-sinking, and Mr. Galwey, who, ably assisted by Mr. Monk, carried on the latter work till it was more than half completed. Altogether the Empress Bridge has been fortunate—certainly it has been so latterly—in the staff appointed for its actual construction; few large works can have been more fortunate. On behalf of that staff I again thank you, Sir Andrew Clarke, for so kindly proposing, and the company for so cordially receiving, the toast of our healths."

BERKSHIRE ARCHÆOLOGISTS IN LONDON.

ON Thursday in last week, as already briefly mentioned, a large party of the members of the Berkshire Archæological and Architectural Society visited London. Leaving Reading by the 9 a.m. train on the Great Western Railway, they proceeded to Westbourne Park Station, where they changed carriages for the District Railway and went on to Westminster Bridge Station. Among the members and friends present were Col. Loyd-Lindsay, V.C., M.P.; Mr. G. Shaw-Lefevre, M.P.; Mr. Geo. Palmer, M.P.; the Mayor of Reading (Mr. J. Silver); Mr. Charles Smith, F.R.I.B.A. (vice-president); Mr. E. J. Shrewsbury, Mr. J. Morris, and others. Proceeding to Westminster Abbey, they assembled in the Chapter-house, where they were received by Dean Stanley, who made a few prefatory remarks, in the course of which he described the Chapter-house as it was and as it is. He observed that the building was of especial interest, inasmuch as it was the cradle of all constitutional assemblies, our House of Commons, which was 600 years old as an institution, having met for the first 300 years in that building. Referring to the interesting wall paintings which were brought to light during the restoration of the building, he pointed out the one (to the left of the door on entering) representing the Apocalypse. This was painted by Abbot John of Northampton, *temp.* Edward IV. The Dean observed that the Dean and Chapter had no jurisdiction in the building, which was the property of the Office of Works, who would, he hoped, before very long, fulfil their promise to provide stained-glass windows for the building, which was formerly the church of the House of Lords.

Proceeding to the Abbey, the visitors were conducted by the Dean to Henry VII.'s Chapel, the tomb of Edward the Confessor, and other notable parts of the fabric, but no connected remarks were made, the Dean's explanations being as to points already familiar to most people.

Proceeding to St. Margaret's Church, the visitors were received by the rector, the Rev. Canon Farrar, who gave an interesting account, chiefly historical, of the building, lately reopened after restoration. Most of the points referred to by the Canon will be found in the paper read by Mr. G. H. Birch a few weeks ago at the London and Middlesex Archæological Society, of which we gave a tolerably full report at the time.

The visitors next proceeded to the crypt of St. Stephen's Chapel (the chapel of the Houses of Parliament), where the hon. sec., Mr. F. W. Albury, read a short paper, in the course of which he said that this was almost the only portion remaining of the old Palace of Westminster, and it formed the basement story of St. Stephen's Chapel. After many years of desecration (it was once used as the dining-room of "the Speaker"), it has been restored as it now is, in accordance with the original design of the late Sir Charles Barry, by his son, Mr. Edward M. Barry. The length is 90 ft.; the width, 28 ft.; and the height, 20 ft. The entrance at the north-west corner is a private entrance from the palace. The seven stained-glass windows represent the ministry and martyrdom of St. Stephen. The wall lining below the windows is of alabaster and inlaid marble. The bosses are the old ones, which have been carefully preserved; they are beautifully executed, and represent the martyrdom of St. Stephen, St. John, St. Catherine, and St. Lawrence, and one of them St. George and the Dragon. The nine panels in the east wall represent the cross in the centre; the others being St. Peter, St. Stephen, St. Oswald, St. Etheldreda, St. Edward the Confessor, St. Margaret of Scotland, and St. Edmund the Martyr.

Having lunched at the Westminster Palace Hotel, the visitors proceeded to the Chapel Royal, Whitehall (the banqueting-house,—and the only portion executed,—of the new royal palace designed by Inigo Jones). Here they were received by the Rev. Canon Knollys and the Bishop of London, who both complained (and with good reason) of the dirty state of the place, the cloth-hangings being thickly covered with dust. Canon Knollys stated that he believed that Her Majesty's Board of Works were prepared to spend 5,000*l.* in alterations and renovation, and the sooner the work was done the better. He suggested that when the work was done some attention should be paid to the celebrated paintings by Rubens which adorn the ceiling, and which show signs of "sagging" in certain places, owing, it is believed, to being badly fastened up, or to the fastenings having given way. Reference was made to the disputed question as to which was the window through which King Charles I. passed out to his execution, Canon Knollys expressing the opinion that it was by the one immediately to the rear of the royal pew. The rich altar-plate was inspected, and was much admired.

Having thanked Canon Knollys and the Bishop of London for permitting them to visit the building, the visitors returned to Reading.

BOLSOVER CHURCH.

THE parish church of Bolsover was reopened on Tuesday, July 16th. This church was in a very deplorable state, its roofs decayed and affording easy access for the rain and snow, its windows denuded of their tracery, the seating and fittings (to quote the words of Bishop Trollope) "sadly requiring revolutionary treatment to make them worthy of the fine old structure they now encumber"; the tower arch blocked up by a brick wall, and huge galleries disfiguring the aisle and western end, to accommodate the bearing timbers of which the capitals of the piers were nearly half-cut through. The chancel arch,—a modern semicircular one,—was achieving a slow but steady victory over the ancient piers, the spire damaged by lightning, and the whole demanded a substantial and thorough repair. Thanks to the energetic and self-sacrificing spirit with which the vicar took up the work, this has now been accomplished. His Grace the Duke of Portland has not only restored the chancel and its fittings, but has provided the principal part of the cost of the remainder. His Grace the Duke of Devonshire, with his characteristic liberality, nobly responded to the vicar's appeal. The Rev. Mr. Hallowes and Mrs. Hamilton Gray rendered material help, and many others whom space prevents our mentioning aided the work. The lectern and fald-stool were presented by the Misses Still.

The church, which is dedicated to St. Mary, is one possessing much historical interest, the Norman portion of it being probably erected by the natural son of the Conqueror (William Peverel), and founder of the castle, who died in 1142. Of this building there probably only remains the semicircular arch over the chancel doorway, which contains a representation of the Crucifixion carved in low relief, and the font, which is clearly Norman, although altered by Late Fifteenth Century masons, by cutting rude tracery upon it. The earliest remains after this belong to the Transitional Norman period, and consist of the piers of the chancel-arch and several of the arch-stones themselves, which were found imbedded in the walls of the later builders. Several capitals of the same period were also recovered, and have been walled in as corbels in the south aisle. A very charming one, happily so cased in the heart of the wall as to have sustained little injury, has been built into the chancel-wall. The tower and spire are Early English, the latter being of the stumpy character not unusual in the locality. The south aisle is of the Decorated period; its windows were completely wrecked, and have had to be renewed, the west window being perpendicular. In this aisle is a monumental recess, in which has been placed a very interesting bas-relief representing the Nativity. This was discovered in 1704 at the north door of the church, where, turned face downwards by some iconoclast, it had long served as a step. It shows considerable traces of colour, and is of fourteenth-century work, as a careful examination of the censer borne by one of the angels and other details clearly show, although it has been frequently assigned to a much earlier date. A series of interesting tombstones having floriated crosses, swords, and other emblems incised upon them, had been used for the same purpose, and are now laid in the chancel and other pavements. The east window of the chancel is the only other relic of the Decorated period. At the eastern end of the south aisle is the Portland chapel, erected in 1618 by the Cavendish family, and bearing their arms and crest. In the vault beneath rest the remains of many of the family, including those of the late Duke of Portland. Two fine monuments adorn the interior,—one of alabaster, erected in 1617 to Sir Charles Cavendish, by his wife, Catherine Baroness Ogle, and their recumbent effigies are good examples of the art of that period. The inscription is worthy of note.

The opposite monument is of Italian design, having Corinthian columns with a finely profiled sarcophagus between them. The entablature and pediment are richly carved, and the whole was executed and erected at a great cost by Italian workmen. It was erected by Henrietta Cavendish Holles, wife of the second Earl of Oxford, to the memory of Henry, second Duke of Newcastle, and other members of the family. In the chancel are memorials of several of the ancestors of the Rev. Mr. Hallowes, of Glapwell, also of Lady Barker. Here also lies the architect whose fertile pencil designed the alterations of the castle keep, and built the stately suite of rooms (now dismantled) for the reception of Queen Henrietta and Charles I.

The additions now made consist of a large north aisle (giving many additional seats) and arcade, new roof throughout (the architect was anxious to preserve the low fifteenth century roof over the nave, but it was found to be in such a state of decay that it was impossible to do so), rebuilding the chancel arch, adding an organ-chapel, and the complete renovation of the chancel, which is fitted with oak stalls, stone credence-table and sedilia, and a reredos of Bath stone, with crocketed canopies. The floor is laid with tiles of simple design. The whole of the seats are of deal stained. The roof is covered with red Staffordshire tiling. The work has been well carried out by Messrs. Shillitoe & Morgan, of Campsall, near Doncaster, under the superintendence of the architect, Mr. J. D. Mitchell-Withers, of Sheffield. The warming has been arranged by Messrs. Stuart & Smith, and the gas-lighting by Messrs. Hydes & Wigfull, both of Sheffield. The bells have been re-cast and added to by Messrs. Taylor, of Loughborough. A clock has been manufactured

by Mr. Smith, of Derby, and the organ enlarged by Messrs. Foster & Andrews, of Hull, the choir generously defraying the cost of an additional stop. The total cost is expected to be about 6,000*l.*

EXTENSION OF UNIVERSITY COLLEGE, LONDON.

FROM the official statement of the position of the above college, published on the occasion of the festival of the fiftieth anniversary of the opening of the Institution, when Earl Granville laid the foundation-stone of an extension of the college buildings, we learn that it is the intention of the authorities to make certain additions in the way of appliances for technical instruction, which, we think, cannot fail to be of interest to architects, engineers, and allied professions.

Between the years 1868 and 1876 the south wing of the college was erected at a cost of 25,700*l.*, and is now entirely occupied by the school classes. It is now proposed (1) to extend the north wing as far as will balance the present south wing; and (2) at some subsequent period to complete the T-shaped terminations of the southern and northern wings respectively. The foundation-stone laid on Tuesday was in connexion with the first part of the project,—the extension of the north wing. The cost of carrying out this portion of the plan is estimated at 50,000*l.*, of which 22,000*l.* would be for the building proper, while it is proposed to spend 3,000*l.* on erecting a chemical laboratory, and no less than 10,600*l.* on the other annexes and alterations, including a very interesting novelty, we mean the erection of an engineering laboratory. The remaining 15,000*l.* are assigned to fittings and other expenses.

As regards the engineering laboratory, we are told that the Council and Senate are desirous of making University College one of the chief places of scientific education for the engineer. "The proposal has been laid before and approved by more than fifty of the chief engineers of the country." The college has already made a start in providing the necessary appliances, having appropriated a sum of money from its present resources for that purpose.

THE WOOD PAVING AT LUDGATE CIRCUS AND THE TRAFFIC.

A DEAD LOCK.

THE vehicular traffic of the great thoroughfares which converge at the Ludgate-circus has for the last fortnight been carried on with extreme difficulty, and been brought almost to a dead lock, owing to the wood pavement which is at present being laid down within the Circus. The scene presented from morning until evening is little less than a chaos, and whilst passengers and travellers by vehicular agency must have had their patience sorely tried by the constantly recurring blocks in the several thoroughfares, pedestrians have had to thread their way across streets hemmed in by vehicles on all sides at the risk of broken limbs and the hazard of their lives. The work is being carried out in four sections, the south-west section having just been finished, whilst the north-west section is now in progress. The sections extend to the centre of the roadway at the bottom of Fleet-street and the foot of Ludgate-hill: one half of the thoroughfare at these points is thus entirely closed for traffic, and hence the accumulation of vehicles, and blocks and stoppages, which, it would appear, cannot be avoided. From about the middle of the forenoon until six or seven o'clock the police,—largely reinforced for the occasion,—have an arduous duty in directing and marshalling the traffic through the labyrinth of vehicles which arrive in succession at the Circus from east, west, north, and south. Fleet-street, New Bridge-street, and Ludgate-hill are almost constantly blocked, and the traffic entirely stopped for as much as five and ten minutes at a time. A day or two ago,—and the same occurs daily,—New Bridge-street was studded with wagons, omnibuses, and other conveyances three abreast, which extended from the Circus to near Blackfriars Bridge, whilst about the same time there was such an accumulation of vehicles locked in between the bottom of Fleet-street and Fetter-lane, that one might have almost walked on their roofs between the two points. It will be another fortnight, at least, before the paving of the Circus can be entirely completed, the whole of the east side having yet to be executed, and in the meantime the present blocking of the adjacent thoroughfares must continue.

FOOTWAY IMPROVEMENTS IN TOTTENHAM.

THE Tottenham Local Board are about to expend a large sum in the improvement of the public footpaths in their parish. At their last meeting they had before them a report of the surveyor, in which he recommended that in a parish such as Tottenham concrete kerb was preferable to granite, and in this the General Purposes Committee agreed with him, and recommended that the Board make an application to the Local Government Board for permission to borrow the sum of 9,271*l.* to tar pave and curb with concrete the footways of the roads in the parish, which roads were set out in the report. It appears that the proposed improvements in the roads set out would cost 10,000*l.*, but there are other roads in which similar improvements would follow. Some members of the Board expressed an opinion to the effect that builders should be called upon to provide the roads for the houses they erected, but the Chairman explained that these roads were not private roads, but the whole of them public roads, and the Board had no power to call upon the builders to make the roads. The roads were ancient roads. The motion was carried, and the surveyor was instructed to prepare the plans and specifications for the works.

SALE OF THE NEW STEAM FERRY.

THE new Steam Ferry at the East End, upon which such a large outlay has been incurred in the erection of warehouses and other works, and which was only opened in May last, does not appear to be a very promising speculation, liquidators having been appointed to wind up its affairs, whilst the whole of the property of the company is announced for public sale. As is known, the Ferry was established for the conveyance of horses and heavy goods across the Thames between Wapping and Rotherhithe, in order to avoid the long and circuitous route by way of London Bridge. The sale, as announced, is by order of the mortgagees, and includes all the buildings and other works, on which the company have laid out such large sums of money, together with the steamers *Jessie May* and *Pearl*, which were built expressly for the company's service. On the warehouses at Wapping alone an outlay of 30,000*l.* is said to have been incurred. These are three in number, two of them containing six floors, and and one four floors, with an aggregate floor-space of 53,570 ft. In addition to the warehouses there is an engine and boiler house, as well as an accumulator-house, which have been provided for raising and lowering the pontoons of the ferry. Likewise a jetty and pontoons, 170 ft. in length, have been constructed under a licence from the Thames Conservancy Board. These works are all on the Wapping or Middlesex side of the river. On the Surrey side, at Rotherhithe, an engine and boiler-house, and an accumulator-house, with engines and machinery, have likewise been erected for lowering and raising the pontoons, as at Wapping, together with a jetty extending 70 ft. into the river. The land on the Wapping side is held from the Bridewell Hospital Estate, for ninety years, at a rental of 578*l.* per annum. It is stated that upwards of 5,000 horses, in addition to wagons and lorries with heavy goods, have been conveyed across the ferry since its opening in May. It took nearly three years to execute the works in connexion with this undertaking, which has now prematurely come to grief.

Cutting the Obelisk.—The obelisk has now been got fairly on to the Embankment; and last week was begun the operation of dressing square the butt end of the obelisk, in order to render it stable by means of the four bronze crabs. By thus squaring it, as determined on by Mr. John Dixon and Professor Erasmus Wilson, with the sanction of the consulting engineers, Messrs. B. Baker and H. Palfrey Stephenson, it is expected to withstand a pressure of 90 lb. to the square foot. At present its stability is computed at 45 lb. to the foot. The force of the most violent hurricanes seldom exceeds 25 lb. to the foot.

OBITUARY.

Mr. J. T. Robinson.—A few days ago Mr. Jethro T. Robinson, the architect to the Lord Chamberlain, expired very suddenly, at his residence, Bloomsbury-square. The deceased gentleman, who appeared to be in robust health, got up and dressed as usual, and whilst engaged in conversation with Mrs. Robinson at the breakfast-table, suddenly fell down, and died immediately before medical assistance could be obtained. The family doctor was sent for, who attended at once, but only to find that life was extinct. It is supposed that the death was from heart disease. Deceased was the architect of the Grecian, City-road; the Victoria; and the Alexandra theatres; Sanger's Royal Amphitheatre; Hengler's Cirque, Liverpool; and theatres at Hull and other large provincial towns; several of which have been illustrated in our pages. The suddenness of his death is shown by the circumstance that our present issue contains a list of tenders delivered to him for certain works about to be done under his direction.

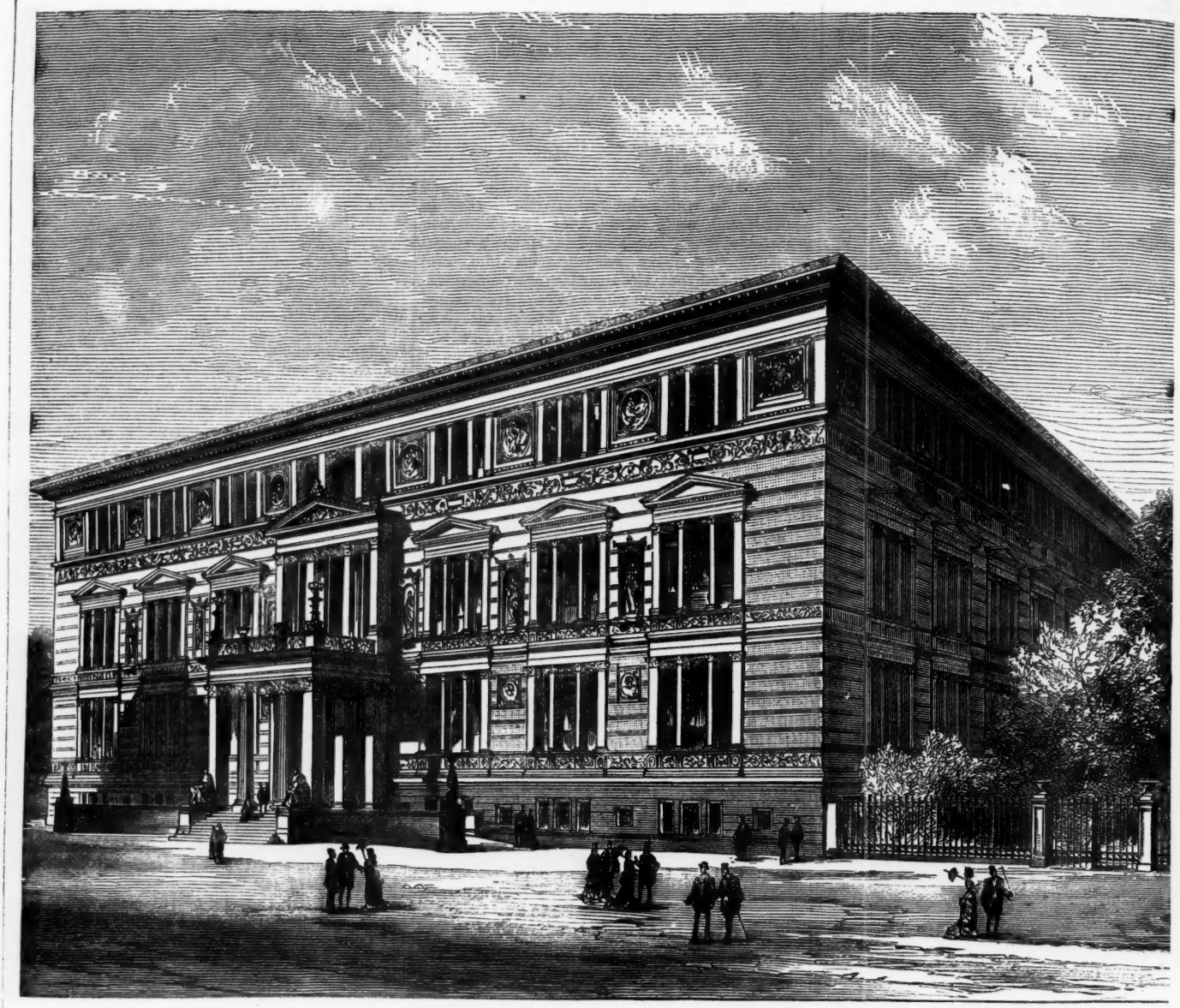
WELLAND VIADUCT.

LIEUT.-COL. TRYON, of Bulwick Hall, keyed the last arch of this structure on Friday, 5th inst. Welland Viaduct is on the Midland Railway branch from Kettering to Manton; it crosses the Welland Valley from Harringworth to Seaton, in the counties of Northampton and Rutland, and is one of the longest structures of this kind in England, being three-quarters of a mile in length. It has eighty-two arches of 40 ft. span, some of them 70 ft. in height. The foundations of the piers and abutments are of concrete,—some of them are of a considerable depth. The whole of the structure is erected with bricks manufactured on the ground, with Derbyshire gritstone springers, string-course, and coping; the arches and spandrels are all covered with two coats of asphalte. The first brick was laid in March, 1876; and the first arch was commenced in June, 1877. It has been pushed on with such vigour that the arches were finished in the first week in July, 1878. The whole of the brick and stone work will be completed by the end of this year, or early in the next. The work contains 30,000,000 bricks, 20,000 cubic yards of concrete, and 19,000 cubic feet of stone. Barrow lime is used in the concrete and mortar throughout the whole work, supplied by Ellis & Sons, Mount Sorrel Junction, Leicester. Messrs. Barlow, Son, & Baker, London, are the engineers for the line, and their inspector of the works is Mr. G. W. Smith; the contractors for the whole of the works are Messrs. Lucas & Aird, London; their agent on the works is Mr. Stannard. Mr. W. H. Lorden is the sub-contractor for the brickwork, and Mr. R. Holmes is the brickmaker.

NEW ENGINE WORKS, AT LEICESTER.

EXTENSIVE engineering works have recently been erected by Messrs. Simson & Company, in Vulcan-street, Leicester. The works cover an area of three acres and a half, and embrace all the usual branches of a general establishment, having distinct buildings for boiler-making and wrought girders, for smiths, for fitting-shops, for pattern-making, and for moulding and casting, thus drawing together the work which had previously been carried on by the firm at three separate places. The buildings are arranged round a large central yard, and are connected by a siding with the main line of the Midland Railway, which forms one boundary of the property. The front part comprises offices, stores, and show-rooms, and also the shops required for the manufacture of boot, shoe, and hosiery-making machines, which are distinct branches of the business. These buildings have been erected from the designs of Mr. J. B. Everard, of Leicester, but the remainder of the works have been designed by members of the firm.

Artisans to the Paris Exhibition.—The following contributions have been made by some of the City Guilds to the fund now being collected by the Society of Arts for the purpose of sending Artisan Reporters to the Paris Exhibition:—The Clothworkers' Company, 100*l.*; the Drapers' Company, 50 guineas; the Mercers' Company, 50 guineas; the Fishmongers' Company, 25 guineas; the Cordwainers' Company, 25 guineas; the Salters' Company, 10 guineas; the Carpenters' Company, 10 guineas.



THE NEW INDUSTRIAL MUSEUM, BERLIN.—PROFESSOR GROPIUS, ARCHITECT.

THE NEW INDUSTRIAL MUSEUM, BERLIN.

THE International Exhibition at Paris in 1867 opened the eyes of the Germans to the fact that in several branches of industry in which art and skill play a considerable part, they were falling in the rear of the French and some other European nations. Following the example of our own country, therefore, which had been enlightened in 1851 as to its own deficiencies in artistic industry, and which had accordingly founded the splendid museum at South Kensington with a view to remedy those deficiencies, the Germans, rather more than ten years ago, began to take steps for establishing a great school and museum of objects of art-industry. The movement was set on foot by private persons, and met with general approval and support in the Fatherland, while the Government, on its part, assisted the project by an annual grant of 15,000 thalers (2,250*l.*). The Crown Prince and Crown Princess of Germany warmly entered into the idea, the former becoming a patron of the institution. So energetically did the promoters go to work, that it was not long after the close of the last Paris Exhibition when the museum first opened its doors to the public. A considerable collection of objects and models had already been made, and these were temporarily housed in a building hired for the purpose where drawing and modelling classes, together with lectures on art-industry, were likewise commenced without delay.

After the Franco-German war of 1870-1871, when, owing to the huge indemnity, money was plentiful and new, and vast projects, more especially in building speculations, were every day starting into life, the new museum shared in the general prosperity, to such purpose that the Prussian Parliament readily granted a sum of 800,000 marks (40,000*l.* sterling), for the purpose of providing the new institution with a fitting home. Professor Gropius, an eminent Berlin architect, was commissioned to prepare plans and drawings of an edifice worthy of the new museum, and was likewise charged with the duty of superintending its construction.

A suitable site was chosen for the building in the gardens of the War Office, and behind the temporary Houses of the German Imperial Parliament. Here work was commenced on the foundations in the spring of 1877, within a year of which time the walls had been carried nearly up to the roof; but it is not expected that the building will be entirely completed within and without before the summer of 1880. The new museum has its front to the north, and covers an area of 70 mètres long by 70 mètres broad, the walls up to the roof measuring 27 mètres in height. The materials used in its construction are sandstone and light red ornamental bricks. The basement, which is almost on a level with the surrounding gardens, is laid out in a number of rooms, chiefly intended for modelling-classes and work-rooms connected with the plastic and other arts. Over this come the ground-floor and two stories, which will accommodate the various collections of objects of art and industry belonging to the museum; the windows of the ground and first floors are each divided into three parts by two artistic pillars, and crowned with pediments. The portico at the chief entrance, springing out from the centre of the principal front, and comprising two Corinthian columns and two pillars, is approached by a gentle flight of steps, which are flanked by pedestals, intended to be surmounted by statues of Holbein and of Paul Vischer, in a sitting position, while the window above the portico, on the first floor, is finished to correspond, projecting beyond and being larger than the others. The façade will be ornamented with a frieze above the windows of the first floor, and with statues between them, with escutcheons, medallions, and especially with Venetian glass mosaics between the windows of the uppermost story, representing various epochs of civilisation.

Entering by the principal door, we are conducted by a flight of stone steps to the vestibule, a very interesting feature of the edifice, being surrounded by galleries, above which the topmost story is broken through, so that the light comes down from the roof. Behind the vestibule we come to the great inner court, 40 mètres long by 22 mètres broad, which is covered by a glass roof, and is surrounded by arcades (of flat arches) of 5 mètres in breadth, supported by syenite columns in both stories. In this portion of the building it is intended to exhibit plastic works of large size. In the main axis of the building, next to this court, comes the principal staircase, richly decorated with wall paintings. Other staircases lead from the east and west sides of the court. In the north front, on the ground-floor, are the rooms for the officials of the museums, for the library and reading-rooms, while the rooms above, on the first and second floors, are to be used as *ateliers*. Around the inner court, on the ground and first floors, will be the rooms of the museum proper, while in the topmost floor will be the rooms set apart for classes of instruction. On the south side of the ground-floor will be the large lecture-hall, capable of seating 500 hearers. All the apart-

BUILDINGS AT THE PARIS EXHIBITION: THE BELGIAN FAÇADE.—M. ÉMILE JAULET, ARCHITECT.

ments of the building are constructed so as to be fireproof. Such are the chief features in the edifice, which will not only be an ornament to the German capital as a piece of architecture, but which will have an important influence on the art industry of Germany in the future. The new institution is further interesting as another proof of the thoroughness with which the Germans enter into all business connected with the questions of skilled industry, art-manufactures, and technical education.

PORCH AND BELFRY OF THE BELGIAN FAÇADE: PARIS EXHIBITION.

THE Belgian façade in the Rue des Nations has probably elicited more praise than any of the other buildings there. With the aid of marble, brick, and stone, an imposing structure has been erected, resembling somewhat an Hôtel de Ville. The architect, M. Émile Jaulet, has adopted the style of the Renaissance (beginning of the seventeenth century), his aim evidently having been to make an interesting exhibition of the products of his country. The details are most carefully executed, and, regarded as a reproduction, the building is certainly entitled to much praise. Want of repose is the objection that may be most strongly urged against it.

LONDON STREET ARCHITECTURE: MESSRS. MARSHALL & SNELGROVE'S PREMISES, OXFORD-STREET.

THESE extensive buildings (having a frontage of 160 ft. in. Oxford-street, and one of 90 ft. in Vere-street), of which we give an illustration, have recently been erected by Messrs. Marshall & Snelgrove, the well-known silk mercers. The leases of this portion of their premises having mostly expired, his Grace the Duke of Portland granted new building leases, desiring that the façade should be of some architectural importance, a condition which has been carried out in a commendable spirit.

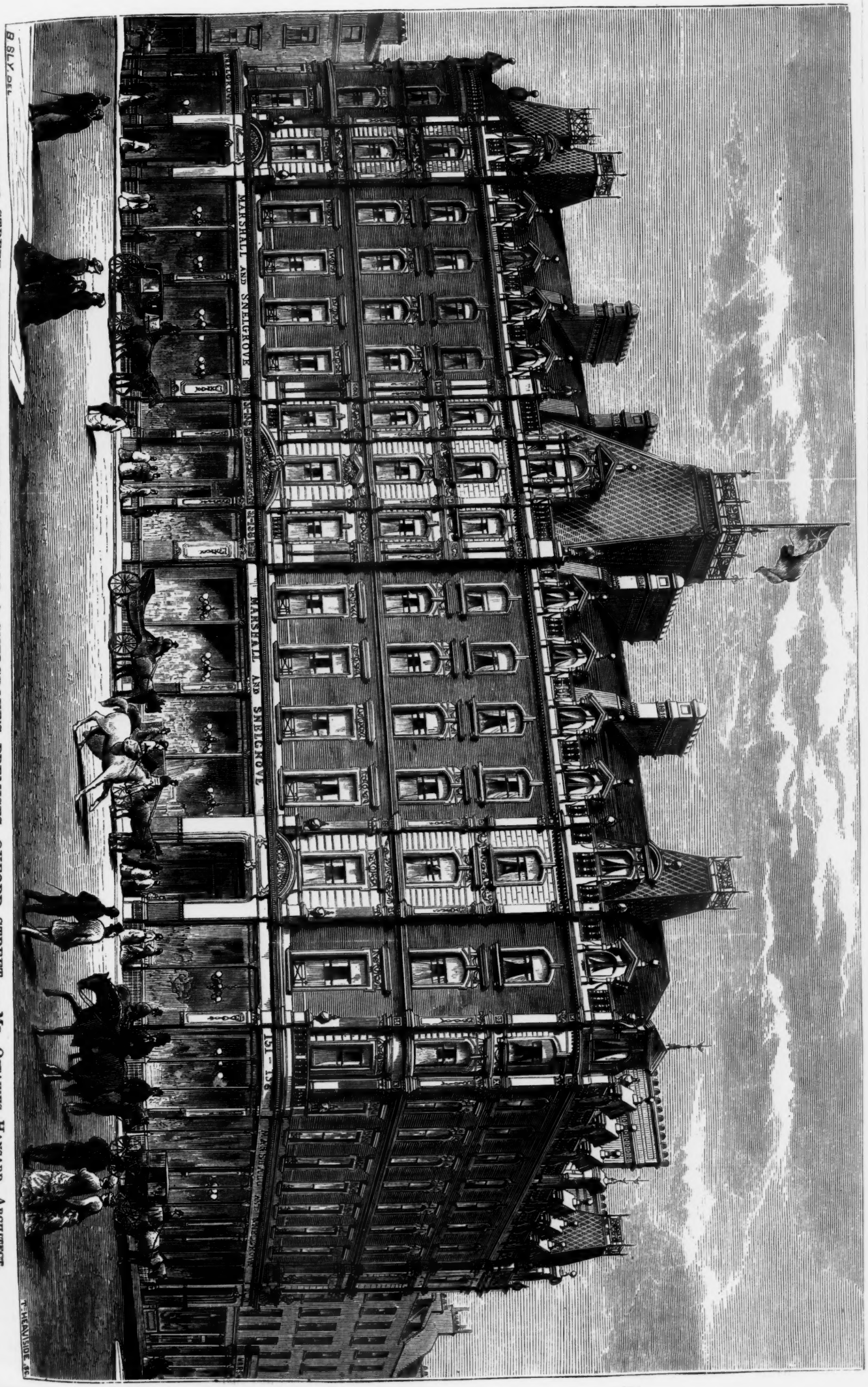
In excavating for the foundations, the workmen came across a portion of an old road, some 12 ft. below the present level of Oxford-street, and running parallel to it, probably the Roman military way which ran from north to south from Verulam, and at Tyburn turned east to London.

The basement, 12 ft. high, extends under the pavement, and is lighted from below the stall-plates, and by Hayward's patent "Prismatic pavement lights," throwing daylight back 30 ft., thus enabling the space to be used for counting-house and other general requirements. The ground-floor is devoted to retail trading business, whilst the first floor is arranged for warehouse and wholesale business, and the other three stories provide sitting and bed rooms, which are situated on each side of a central corridor, giving accommodation for some 250 of the *employés* of the firm. Each room is ventilated by an up-shaft as well as open fireplace; over each gas-burner is a bronze tube connected with an up-flue, and a swing glazed flap over each door into the corridors, aids in obtaining a continuous current of air.

There are two fireproof floors, consisting of riveted wrought-iron girders, and rolled-iron joists, carried on cast-iron columns; these and the floors are encased with concrete composed of Portland cement and burnt ballast.

The façade in both streets is carried out in yellow malms and Corsham Down stone, all the cornices, string-courses, and weatherings being in Portland stone. The lower portion is divided into bays by pilasters of Portland stone, below which are Shap (Westmoreland) granite pillars on grey Aberdeen moulded bases, the Shap and Portland being finished at their junctions with ornamental bronze bands. The upper portions of pilasters have bronze ornaments in panels harmonising in colour with the stall-plates and sash-bars.

From pavement to underside of shop-cornice the height is 17 ft., giving an unusual quantity of light to the counters.



LONDON STREET ARCHITECTURE: MESSRS. MARSHALL & SNELGROVE'S PREMISES, OXFORD STREET.—Mr. OCTAVIUS HANSARD, ARCHITECT.

The upper portion of the building is divided into three stories, the whole being surmounted by a balustrade, broken at intervals by dormers, terminating with high mansard slated roofs, with ornamental iron railings. There is a central tower, and lateral towers, which are entirely of stone, with pilasters and cornices, the friezes of window-heads on first floor being carved with flowers emblematical of countries, cities, and fabrics connected with trade.

In such a large establishment it was necessary to give more than ordinary consideration to the gas supply, and consequently unusually large meters have been fixed and means adopted to reduce the consumption by the use of "wet governors," through which the gas passes before leaving the meter-houses, by which the pressure is considerably reduced below that in the street-mains, and this gas is distributed to the building during the daytime at 5-10ths, and in the evening at 7-10ths pressure. When it is remembered that the pressure in the street-mains varies between 3·5 and 4·0, the value of governors in conjunction with supply-pipes of ample size will be readily appreciated.

The building has been erected by Messrs. Lawrence & Sons, of Waterloo Bridge, Mr. James Stapleton being their foreman of works. The masonry and carving have been well executed by Mr. J. W. Seale, of Walworth. The gas arrangements and fittings were entrusted to Mr. James Slater, of High Holborn; and the whole has been carried out from the designs and under the superintendence of Mr. Octavius Hansard, F.R.I.B.A., of Argyll-place, Regent-st.

THE NEW EDDYSTONE LIGHTHOUSE.

It is announced that the Trinity Board, after six weeks' consideration, have decided to build the new Eddystone Lighthouse themselves, and not under contract. The estimate of the Board's engineer was 90,000*l*. There were three tenders, the lowest, that of Mr. Pethick, of Plymouth, being 105,000*l*.

The *Western Morning News* gives the following description of the proposed new structure:—The first point which offered itself for consideration was obviously that of the precise site for the new work. Smeaton's tower (the present building) was, of course, erected on the very site of its predecessors,—the wooden, or mostly wooden, structure of Rudyerd, which was completely destroyed by fire; and the fantastic building, also of wood, put up by Winstanley, as the first occupant of the rock, and which, together with its author, was utterly annihilated in the great storm of the 26th of November, 1703, after a brief but useful existence of three years. The "House Rock," as it is called, upon which the present tower is built, stands not alone, but is only one and the highest of a group of rocks and reefs, projecting their jagged summits in the range of tide between low and high water. These comprise the House rock and reef, the South rock and reef, the South-east reef, the East rock, and a detached spit, the North-east rock. The position selected for the new tower is on the South Reef, about 100 ft. away from the existing lighthouse, across the gut or channel, and in a south-easterly direction. It has the advantage of partial protection, towards the west and south-west, by the House Rock and reef, but the disadvantage of being considerably lower in elevation. No portion of the site rises above the half-tide level, and the lowest parts, where the foundation courses of the new structure are to be laid, lie 4 ft. below the low-water level of an ordinary spring tide; whereas the rock whereon Winstanley, Rudyerd, and Smeaton carried on their operations, so far as relates to the immediate site of their labours, was entirely above the half-tide level, and its summit at the present landing-place is not covered at high water of ordinary spring tides. It will readily be understood that this constitutes a material aggravation of the difficulties and hazards, already great, of this new and arduous enterprise. For not only is the exposure to the action of surf and ground-swell more than proportionately increased, but the duration of the already too limited time within which it is possible to carry on work "in the dry" is most seriously shortened; and no inconsiderable portion of the basement must be executed entirely under water. The retention of the old tower during the construction of its successor is a *sine quâ non*. The lower level of the foundation for the new work has also exercised an influence on the form, proportions, and dimensions of Mr. J. N. Douglass's design, which is not only very much larger than that of Smeaton, but varies considerably therefrom. Fundamentally the same general form is to be adopted; and, technically speaking, the shaft of the tower is a concave elliptic frustrum,—realised in Smeaton's original conception as the bole of an oak,—but, in order to give weight and solidity to the substructure, with corresponding power of resistance to the violence of the waters, the lower courses of masonry, up to and inclusive of the twelfth, are to be perfectly cylindrical in form up to the level of about 3 ft. above the high-water level of ordinary spring tides. At this point there is a diminution of more than 8 ft. in the diameter, forming a commodious landing platform, whence springs the shaft proper of the tower. The diameter assigned to this cylindrical base is 44 ft., and that of the tower at its springing is between 35 ft. and 36 ft., at a height of a little over 22 ft. above the foundations. The circular shaft attains its smallest dimensions (18 ft. 6 in. diameter) at a height of about 134 ft. above the rocky bed of its foundation; swelling out, with a bold and graceful cavetto, to an enlarged diameter of 23 ft., maintained up to the level of the gallery-course or lantern floor, at a total height of 142 ft. above the base of the light-house, and 122 ft. 6 in. above the level of high water of ordinary spring tides. The magnitude of this noble light-tower will be at once apparent by comparison with the similar dimensions of its existing predecessor. Smeaton's shaft diminishes from a diameter of 34 ft. at the foundation-course to 26 ft. at the level of high water ordinary spring tides; and thence to 20 ft. at the entrance door, and 15 ft. at the top, the gallery-course being but 61 ft. above high-water mark, and the lantern-floor about 7 ft. higher. Thus the new light will be displayed at an elevation 55 ft. greater than that of the old one, and its range of visibility and efficiency will be proportionately extended. It would be superfluous, in regard to an as yet unexecuted work, to describe minutely all the proposed details of its construction; but some few of the general features of the design may be glanced at with interest. The structure is to be built entirely of granite, and to be entirely solid (except a small water-tank) up to the level of the entrance-floor, at about 22 ft. above the landing-platform; the access from low-water mark being by an outside step-ladder, formed of gun-metal cleats, recessed in the granite below the platform, and projecting from the surface of the tower above that level. The foundation is to be formed by cutting away the rock in benchings or steps, for the first four courses, all the stones which bed on the rock being secured thereto by metal bolts. Throughout the entire structure every individual stone will be closely united, or bonded in to those surrounding it, by solid dovetail projections, fitting into corresponding recesses; and each course of stones is similarly to be connected with those above and below it; so that in this manner, when set in Portland cement, the entire mass will acquire almost the homogeneity and strength of the solid granite rocks from which its component elements were quarried, as has been amply demonstrated by experience. The hollow upper portion of the tower will be similarly built, the rings being formed of single stones running through from the inside to the outside of the shaft. The internal diameter, as proposed, varies from 11 ft. 6 in. to 14 ft., and the thickness of the ring from 8 ft. 6 in. to 2 ft. 3 in. This part is to be divided by arched granite floors into nine stories, apportioned as stores, coal, oil, crane, living, bed, and service rooms. The door and window openings will be provided with gun-metal doors, sashes, and shutters; and the general fittings of the tower are proposed to be of the same first-class, solid, and expensive character,—therein lying true economy, from the very situation, nature, and purpose of the lighthouse. Summing up the total quantity of the granite in the proposed new tower, it is approximately something less than 69,500 cubic feet, giving to the mass a total weight of about 5,150 tons of masonry. The metal-work in cast, malleable, and wrought iron, in gun-metal, Muntz-metal bolts, copper, and brass and other materials will make up a gross total of about 50 tons more, or 5,200 tons in the whole. This great mass will have to be wrought, set up, and fitted together on shore, taken down, loaded in vessels, transported by sea to the Eddystone rocks,—a distance of fourteen miles from Plymouth,—and there unloaded, hoisted, and built into position, at a mean height of 43 ft. above the level of low water of an ordinary spring tide. The time allowed for the completion of the work is five years, giving an average of 1,030 tons to be erected in each year, practically limited to the summer season, so far, at least, as the actual work at the rock is concerned, inasmuch as during the winter half of the year it is impossible to carry on operations of this kind at all; and it may be added, indeed, that the work can only be executed intermittently even during the summer months.

THE DOME OF THE ROCK.

SIR,—Mr. Fergusson having done me the honour to notice my remarks on the architecture of the Dome of the Rock, I would beg leave to invite him in your columns to criticise further than he has done the statements in question. I do not presume to offer an opinion as an architect on such questions, and the strength of Mr. Fergusson's case must always lie in his undisputed reputation for architectural learning. I merely wish to call attention to facts which must strike the eye of any one visiting the Dome of the Rock.

Mr. Fergusson has replied at length on the subject of the arches, and the gist of his remarks appears to be that he supposes the arches under the Dome to have been struck from three centres, while the reviewer makes them to have been struck from two. The actual form is accurately shown in Lieut. Kitchener's photograph. Also he notices that round arches occur both in the Mosque of 'Amru and on the exterior of the Dome of the Rock.

Mr. Fergusson does not state his reason for ascribing the pointed arches in the Aksah and 'Amru mosques to 'Abd el Melek rather than to the later restorations, nor does he notice that the arches in the Dome of the Chain, which is generally supposed to be 'Abd el Melek's work, are semicircular. Round arches are thus apparently not distinctive of Byzantine work.

I should be glad if Mr. Fergusson would also treat at length the question of the pillars. To an outsider like myself it appears to be an indication of primary importance that these pillars are so different one from another, and it is the more important to call attention to this, because in his earliest work on the question Mr. Fergusson speaks of the "order" of the Dome of the Rock.

Every one acquainted with Jerusalem will know the extreme difficulty of taking measurements in the interior of the Dome of the Rock. I have myself been cursed and hustled while drawing details; but I succeeded in taking sketches of the twelve capitals under the Dome, which have been recently published in my book, "Tent Work in Palestine" (vol. i., page 323). I believe I shall not be mistaken in asserting that it is most unusual, in Early Byzantine buildings, to find the great difference of design here found in capitals belonging to one set of pillars, and certainly it must be unusual to find differences of diameter and of length in the shafts,—differences which are sufficient to be visible to the eye. In Constantine's Basilica at Bethlehem the capitals are of one design, and the diameter and height of the shafts are uniform. In the Aksah Mosque, in that of Amru, and in the fine Mosque of Jezzar Pacha at Acre, the same peculiarity is remarkable,—pillars, apparently torn from some older building, have been used up, and in many cases the capitals do not appear to be those originally intended for the shafts.

The character of these pillars in the Dome of the Rock is unmistakeable, for architects agree that they cannot have been Arab work. But it is not a little important for Mr. Fergusson's theory, that he should be able to show that they were originally designed for their present position, which is certainly not the impression that would be naturally produced by their appearance.

The architectural argument is far the strongest part of Mr. Fergusson's case. With regard to history and topography, he cannot claim to hold a position of superior knowledge; but he might fairly accuse me of shifting ground,—because unable to answer his reply,—were I to insist on the strong objections which may be urged against his theory on these grounds.

There is, however, an architectural question, to which I would call attention, about which it seems to me Mr. Fergusson is bound to furnish a satisfactory answer.

Eusebius describes the Basilica erected by Constantine, and the hemisphere on the west, which was the crowning part of the work. Theodorus, in 530 A.D., speaks of the same building ("in the middle of the city," I may remark in passing), and states that the Mount of Calvary, to which there was an ascent by steps, was fifteen paces away, and under one roof with the sepulchre.

When, however, we come to the eighth century, we find the description different: we have a round church (which Mr. Fergusson identifies with the octagonal Dome of the Rock), a separate chapel of Calvary, and other separate buildings. The rough plan of Arculphus shows these in positions which give a general result strongly resembling the plan of the present Church of the Holy Sepulchre. It is this plan which Mr. Fergusson professes to follow, though it may be remarked that the known levels of the rock have obliged him to place one of the buildings (representing the original Basilica) in a position quite different to that in which it is shown by Arculphus, while his Calvary is actually on a lower instead of a higher level than his supposed Holy Sepulchre.

Now, if we accept the evidence of the contemporary history of the Pascal chronicle, the Basilica of Constantine was destroyed in 614 A.D., and the change of plan is accounted for by the fact that Modestus replaced the great building "under one roof" by the small chapels. But this history Mr. Fergusson refuses to credit; thus we are reduced to the apparent paradox that Mr. Fergusson supposes the seventh-century chapels to be represented by the Dome of the Rock and by other buildings, of which not even the foundations are visible, though the rock is on the surface where they should be; yet these separate chapels he ascribes to the time of Constantine, at which period the "Round Church" of Arculphus is entirely unnoticed,—the "hemisphairon" of Eusebius having apparently occupied the same site.

Mr. Fergusson tells us that on seeing the imperfect drawings of Mr. Arundale, he at once "jumped to the conclusion that the Mosque of Omar (*i. e.*, the Dome of the Rock) and the Aksah were Christian buildings." Against this assumption we have to balance,—

1. The Cufic and Arabic inscriptions on the buildings, giving the dates of the various parts.

2. The account given by Arabic historians of the building of the Dome of the Rock by 'Abd el Melek, and of his restorations in the Aksah Mosque.

3. The descriptions by Christian writers from the fourth to the eight centuries of the position of Constantine's Basilica north of Sion, in the middle of the city.

Mr. Fergusson is obliged to add to his hypothesis of the transference of site for the Holy Sepulchre four other transferences of site; first, that of the Sakhrah, or Holy Rock, from some other position occupied in Omar's time (and, according to his view, from a place where no rock exists) to the present site; secondly, the transference of the *traditional* site of the temple from some other site to that recognised in the twelfth century (*i.e.*, the Sakhrah); thirdly, the transference of the site of Zion; fourthly, transference of the traditional site of the Prætorium.

Architectural criticism needs to be of a very convincing character which can demolish such a mass of evidence, and the opinion of a distinguished architect, who has done more than any one else to throw light on the date of styles in Syria, is, unfortunately, quite opposite to that of Mr. Fergusson.

CLAUDE R. CONDER, Lieut. R.E.

Growth of Bedford.—Mr. F. T. Mercer, surveyor, has just completed a survey and map of the borough of Bedford. As illustrative of the growth of the town, he says:—"The area upon which Bedford now stands appears to be more than twice as large as that of the last map, published thirty-seven years ago. In that map there are no railways, nor any buildings beyond Priory-street, Water-lane, or River-street, up to Union-street, on the west. The district of New Town was only laid out as far as Albert-street, and continuing the north side of the town to Kimbolton-road we find nothing much beyond the entrance to that road. On the east side of the town there appears nothing beyond St. Cuthbert-street, whilst even in Gadsby, Duke, and Mill streets considerable areas of vacant ground are shown."

OUR FOOTPATHS.

SIR,—No more opportune season will probably suggest itself to write about footpaths than the present, as the subject is of interest to all those who are now revelling amidst rural scenes or at seaside resorts.

Our footpaths open up the more beautiful scenes in nature; they follow the course of the winding river, and penetrate the umbrageous forest. In this respect they are superior to turnpike roads, which latter are not merely dusty, but in many cases wend their serpentine lengths through the least interesting parts of the country. The country is now in its noon-tide attire. Nature is voluptuous in her display of all that is lovely and enchanting to the genuine lover of natural beauties. What wondrous treasures are now open to holiday-making botanists and naturalists! What rich scenes of undulating corn-fields, verdant valleys, and sylvan glades delight the gaze of the enthusiastic artist! Were it not for the footpaths, which form a perfect network over the country, many of the loveliest spots in England would be unseen but by the favoured few. To see the country to perfection we must leave the dusty roads and wander across the footpaths through "green daisied fields" and shady woods. Who but the weary and "worked to death" denizens of our large towns can express the ecstatic delight which they experience when strolling along well-beaten footpaths, and the balmy air, cooling and invigorating, animating them with new hopes, strengthening their weak and half-formed resolutions, and giving them a new lease of life wherewith to renew the stern battle for existence? The beauties of nature, and the moral and physical benefits derived from their contemplation have been favourite themes with the poets of all ages, and that which has excited the tenderest sympathies, awakened the warmest emotions of the heart, and inspired with sublime conceptions the best of mortals, must be in itself good, and its acquisition desirable.

As our towns enlarge, and the population increases, occasional glimpses of the country will become more than ever a *sine quâ non* of our existence. What is life, I would ask, surrounded by a polluted atmosphere, smoke-begrimed houses, an incessant flare of gas, lumbering vehicles, and screeching locomotives? It is with a desire to see the people retain this privilege of penetrating far and wide into the country, and drinking freely and copiously of its charms, that I have ventured to draw the attention of your readers to the too glaring fact that within the last few years hundreds of public footpaths have been closed without comment, and the public deprived of the use of that to which in many cases they had a legal right. That a deep interest is taken in these footpaths is evident from the fact that, in those districts where encroachments are attempted, the inhabitants of the various localities are always ready to provide the sinews of war,—as far as their means will permit,—to oppose any endeavours that may be made to deprive them of their rights. In two or three instances local societies have been established for the purpose of preserving the footpaths within their several districts.

I have no doubt architectural students, antiquaries, and others will find when visiting favourite scenes during their holiday tours that many old and familiar haunts have within the last twelve months been closed against them, thus depriving them of much innocent pleasure and desirable recreation.

As some little consolation to such, I would call their attention to the existence of an association which has recently been formed, called the "Footpaths Defence Association." The objects of this Association are clearly set forth in the prospectus, which can be had on application at the offices, No. 28, Essex-street, Strand.

Any information which tourists and others may be able to obtain respecting enclosures of public footpaths and rights of way, &c., will have due consideration, if forwarded to the secretary.

Such a society as the above, which seeks by reasonable and legitimate means to obtain for and preserve to the people access by footpaths to those sylvan scenes for which our native land has ever been famous, should meet with the hearty support and co-operation of the general public.

The destruction of natural beauties is no recent innovation, although, probably, a more frequent occurrence during the past few years than at any previous period. Whilst asking the aid of a generous public to stay these wholesale spoliations, and hoping a more enlightened and less selfish view will be taken in the future by landowners and others who attempt these depredations, we can but lament with the poet, who in 1634 called attention to

> "—— the havoc and the spoyle,
> Which, even within the compass of my days,
> Is made through every quarter of this isle
> In woods and groves, which were the kingdom's praise."

The interest which the *Builder* has invariably evinced in all matters bearing upon public health must plead my excuse for thus trespassing upon your space, as I feel that in the free use of footpaths the people have within their reach the means for the attainment of health, strength, and consequent happiness.

JAMES GEO. BUCKLE.

THE VICTORIA DOCK EXTENSION.

ON Tuesday last the Society of Engineers visited the works of the Victoria Dock Extension, extending from Silvertown to Beckton, opposite Woolwich. The works (of which Mr. A. M. Rendel is engineer-in-chief, and Mr. A. C. Andros, resident engineer) were so fully described by us a year ago (vol. xxxv., p. 727), on the occasion of the society's visit at that time, that we have only now to report the progress that has been made during the past twelve months. The double tunnel and bell-mouths, through which the Woolwich branch of the Great Eastern Railway is to be diverted, are practically completed, and it is expected that they will be opened for traffic in the course of the next two months. These tunnels and bell-mouths are constructed in white gault bricks, supplied by the Aylesford Pottery Company, and set in Portland cement. The new entrance-lock has also made great progress, and is a very fine work, probably the largest in the world, being 800 ft. long over all. The lock-walls are of concrete, varying in thickness at different points, and faced with hard Staffordshire blue bricks, supplied by Mr. Joseph Hamblet, of West Bromwich. An immense quantity of excavation on the site of the new dock has been done during the past year, principally by means of the "steam-navvy" and the steam "dredger" for land excavation. Both these ingenious and labour-saving machines were described in our former account of the works. They have been almost indispensable to the execution of the work, seeing that the quantity of excavation required to be done was about three million cubic yards. The walls of the great ninety-acre dock are entirely of concrete, and have an aggregate length of upwards of three miles. The north wall is very far advanced towards completion, and the south wall is making good progress, although it has been much more recently decided upon. It was at first intended to leave the south side of the dock with a sloping bank of earth lined with puddle, but this intention has been abandoned in favour of a wall, so that the dock will have quayage on each side. These concrete walls are the great speciality of the works, and should be seen by all interested in concrete work. They are about 38 ft. 6 in. high from foundation to top of coping, 18 ft. thick at the base, and 7 ft. thick at the top, supported at intervals of 50 ft. by huge counterforts of the same material. The coping is also of concrete. Two large graving docks, capable of receiving the largest vessels entering the docks, are being constructed at the east end, the walls being of concrete. It is expected that the works will be completed, and the new dock (which will, we believe, be the largest in England) opened at the latter end of next year. The satisfactory character of the materials, and the good workmanship, were spoken of with great approbation by the visitors. Messrs. Lucas & Aird are the contractors, their representative on the works being Mr. W. Colson.

Bridging the Forth.—Mr. Bouch, C.E., Edinburgh, has received instructions to prepare working drawings for the proposed bridge across the Forth at Queensferry. The span height will be 135 ft. (instead of 150 ft. as at first suggested), provided the Government consent. The bridge will be on the suspension principle, having two lattice-girder spans, each about 1,100 ft. in length, which will be supported midway on the island of Inchgarvie. The promoters have obtained power from Parliament to guarantee to the undertaking a revenue of 75,000*l*. It is expected the works will shortly be commenced.

BRIDGE ACCIDENT ON THE LONDON AND NORTH WESTERN RAILWAY.

AN accident of a frightful, and at the same time of a remarkable character, has just occurred on the London and North-Western Railway, in the neighbourhood of Winsford, Cheshire. A double line of rails is now in course of construction between Crewe and Warrington, and whilst a large gang of men was engaged in taking down a bridge known as Moulton Hall Bridge, in order to make room for the double line, one of the men said he would not work there any longer, as he was afraid of the bridge giving way. Some of the other men laughed at him, but he had barely left the bridge when the whole structure crashed in, carrying with it three or four of his fellow workmen, and one of them, on being extracted from the rubbish, was found to be seriously injured. Assistance was telegraphed for, and a special train was sent down from the railway company's hospital at Crewe. The man, on being examined at the hospital, was found to have sustained frightful injuries, his left thigh being badly broken, a number of ribs staved in, and his spine also injured. He has since died.

WORCESTER DIOCESAN ARCHITECTURAL AND ARCHÆOLOGICAL SOCIETY.

THE first excursion of this society for the present season took place on the 10th inst., when a large party proceeded in carriages to Alcester. On the side of the Alcester-road several sequestered churches are situated, and one of these, Flyford-Flavel, the party stopped at to examine in detail. They first passed Grafton-Flyford. The church at Flyford-Flavel is a plain structure, consisting of nave and chancel, with a square tower at the west end. The exterior has a neglected aspect, nettles abounding around it, and a great elder-bush covers one side of the timber porch. The interior presents a similarly miserable condition, and Mr. Noake, who gave an account of the architectural features, said that it was the worst specimen of church neglect in the diocese. He said that the society had before remarked upon its wretched state, and he thought if the bishop could but see it, probably the patron of the living, at his request, might be induced to do something to amend its disgraceful state. A beggarly wooden gallery exists at the west end, and under the tower is a heap of rubbish. As to the architectural points of the church, Mr. Noake stated that the Perpendicular style was chiefly apparent, but there was also Early English work, and an old circular-headed doorway. The chancel has been rebuilt in modern times, but in a debased manner. There is a screen of old woodwork below the chancel arch, and in the south chancel wall is a curious wide recess, for which no use can be assigned. An opening to the stairs of the rood-loft is still perceptible. An octangular font may be noticed, and under the tower is a massive wooden chest, once the bole of an old tree, and 10 ft. in length, but with its lid open as if to receive chaff or any other ingredient, instead of parish records. As if in solemn mockery, a notice is affixed to the external wall of the structure declaring that "Whoever damages this church, or commits any depredation," &c., "will be prosecuted." The party drove on many miles further, passing from Worcestershire into Warwickshire, and next made a pause at Exhall. Here was a pleasing rest from the toils of research, for the Rev. J. E. Cole, the incumbent of Exhall, invited the excursionists to luncheon. The church is a small building recently restored.

Leaving Exhall, the party drove rapidly to Wixford Church, the place recalling Shakspeare's appellation of "Papist-Wixford." The structure presents a curious appearance, showing a high roof, with a much lower projecting chancel, and a low square wooden turret at the west end. This aspect is occasioned by two structures being now connected together, as explained in a paper read by Mr. W. J. Hopkins. The original structure was called St. Milburgh's Chapel, and Mr. Hopkins in afterwards going round this part of the building pointed out its most remarkable features. He particularly noticed the lancet windows on the south side of the chancel. The walls of the church are whitewashed, the west end being completely blocked up. There is a wooden porch and plain Norman doorway. Passing into what was formerly a chantry chapel dedicated to St. John the Baptist, a large altar-tomb of Purbeck marble commanded attention, there being upon it the full length effigies in brass of Thomas de Crewe and his wife, with their armorial bearings, the date of sepulture being 1400 and 1419. On either side of the figures at their base a naked foot is represented within a circular scroll. It was stated that the Crewe family was collaterally connected with the noble family of the Beauchamps of Powick. Seated around this sepulchral memorial, the company listened attentively to a paper by the Rev. T. P. Wadley on the heraldry displayed on the Crewe tomb, and pictured formerly and still partially in the windows. Returning to Alcester, the excursionists wound up the day by dining at the "Swan" Hotel.

SHROPSHIRE ARCHÆOLOGICAL SOCIETY.

THE Shropshire Archæological and Natural History Society held its annual excursion on the 8th inst. Proceeding by train to Shifnal, the members took carriages to Tong Castle and Church. At the latter building, the "Great Bell of Tong" was inspected. It is in the tower, and those who made the ascent had their attention arrested by the following lines painted on a board at the bottom of the belfry stairs:—

"If that to ring you doe come here
You must ring well with hand and care,
Keep stroak of time and goe not out
Or else you forfeit out of doubt.
Our law is so concluded here
For every fault a jugg of beere—
If that you ring with spurr or hat
A jugg of beere must pay for that;
If that you take a rope in hand
These forfeits you must not withstand;
Or if that you a Bell ov'r throw
It must cost sixpence ere you goe.
If in this place you sweare or curse,
Sixpence to pay, pull out your purse,
Come pay the clerk his fee;
For one (that swears) shall not go free.
These laws are old and are not new,
Therefore the clerk must have his due.
GEORGE HARISON, 1694."

Although this seemed to infer that the belfry was rather dangerous ground to explore, many ventured up the dark staircase, and had a sight of the great bell, which weighs 2 tons 8 cwt. Unfortunately it was cracked in 1849, when ringing for divine service. It is stated that nine persons may comfortably stand underneath it. It was first given to the church in 1518 by Sir Henry Vernon, knight. It was broken by the Parliamentary forces in the time of King Charles I., and was recast at the expense of the parish in 1720. In the rear of the church are the remains of an ancient priory. Donnington Church was the next place visited. The church is being restored, under the direction of Mr. Martin, architect, who pointed out the fine workmanship of the hammerbeam roof, which was erected, as a tablet let into the woodwork informs us, at a previous restoration of the building. The tablet has the inscription,—"Thomas Twigg, carpenter, 1635," and the initials of the same artificer are on every beam. Mr. Martin remarked that Mr. Twigg's principle of roof construction was bad, as, there being no tie-beams, there was nothing to check an outward thrust, and consequently the walls were liable to be thrust out of the perpendicular, and this was actually the case in places. The building at present consists of only a chancel and nave, but Mr. Martin was strongly of opinion that at some period there was a south aisle. The building was refaced in 1784, and was also partially restored. It should also be stated that the Twigg roof was 3 ft. higher than the original roof of the building. After a short stay the party were called to their carriages, and they then proceeded to White Ladies. The ruins of this convent of Cistercian, or White Nuns, so called to distinguish it from a nunnery of Black Ladies, about a mile on the other side of Boscobel, is situated some distance off the road in the middle of a meadow. The party alighted, and passing through Spring Coppice, inspected the exterior of the ruins of the monastery. These are not very imposing, owing to modern masonry, which has been introduced to fill up the apertures in the Norman walls, and thus secure a certain amount of privacy for the ground enclosed. Boscobel House was next visited. It is celebrated in history as having formed a temporary refuge for King Charles II. after the battle of Worcester, and is supposed to have been erected by Mr. Giffard, of Chillington, in the time of Queen Elizabeth. What is believed to be the veritable oak tree in which the king took refuge was visited. It measures 19 ft. 5½ in. in circumference at the base, and is 12 ft. 3 in. in girth, at a height of 4 ft. Some controversy has taken place as to the identity of the tree with that in which the king took refuge, it being contended by some inquirers that it is only an offshoot of the historical tree.

Weston Park having been visited, the party took carriages to Shifnal, where the annual dinner was held.

PARLIAMENTARY.

Rivers Pollution Prevention Act.—In the House of Commons last week, Mr. Sclater-Booth, in reply to Sir U. Kay-Shuttleworth, said the Rivers Pollution Prevention Act, 1876, had come into operation just about as it was expected it would do. A number of cases had arisen and been dealt with, and others were still under consideration.

The Artisans' Dwellings Act.—In answer to Sir U. Kay-Shuttleworth, Mr. Lowther said that this Act had been put in operation by three towns in Ireland, nine in England, and one in Scotland. As there were only five towns in Ireland which could come under it, whilst there were 71 in England and six in Scotland which could take advantage of its provisions, it would be seen that Ireland had been, out of all proportion, the most willing to adopt it. Mr. Cross added that he thought the time had arrived when an inquiry should be made why, in cases where official reports had been received, the local authorities had not taken advantage of the Act.

Metropolitan Gas and Water.—Mr. Cross, in answer to Sir U. Kay-Shuttleworth, stated that it was not the intention of the Government to propose any measure on this subject this session, and it was rather too early to give any promise for next session.

MONUMENTAL.

Leopold I., King of the Belgians.—The monument which is to be erected in memory of the first King of the Belgians will be of a character akin to our own Albert Memorial, and, like that monument, will be the work of several artists. M. de Curte has produced the general design, in which a statue of the late King, to be executed by M. Guillaume Geefs, will be placed under a Gothic baldacchino or canopy, the summit of which will be about 130 ft. in height, and will be surmounted by a figure representing the genius of Belgium. Statues of the nine provinces of the kingdom will be placed round this Gothic tower.

Statue of Burns for Kilmarnock.—Mr. C. W. G. Stevenson, sculptor, Edinburgh, has just completed the full-sized model of his statue of Burns, which has been commissioned for the town of Kilmarnock. In this figure is reproduced, on the scale of over 8 ft., the design embodied in the small model which was selected in competition. The poet is represented in standing posture, as if he had paused in the course of a rural walk to record some flitting fancy. In the features, as well as in the costume, the well-known Nasmyth portrait has been closely followed. The committee have authorised the artist to proceed at once with the execution of the work in marble.

Sulphuric Acid Gas in the Atmosphere. Some statistics of the amount of sulphuric acid gases evolved by the consumption of coal in London were given in a paper read by Mr. James Mactear before the Society of Arts. It was estimated that the coal annually consumed in London is over 8,000,000 tons, equal at one per cent. of sulphur to 80,000 tons, or as oil of vitriol to 245,000 tons. This is more than five times the amount given off from all the sulphuric acid works in the country. For the whole of the United Kingdom the figures are:—Coals consumed, 114,043,940 tons, which at one per cent. will give as sulphur 1,140,439 tons, or, in round numbers, as oil of vitriol, 3,500,000 tons. Mr. Mactear also gave some interesting details of the method adopted (invented by himself) for the recovery of sulphur from the chimneys of alkali works, as in Glasgow, where some 30,000 gallons a day soak away in the form of a yellow liquid from vast heaps of alkali waste, and run beneath the city through a sewer into the Clyde.

COMPETITIONS.

Yarmouth Town-hall.—The *Norfolk Chronicle* understands that Mr. Boardman, architect, of Norwich, has been asked to assist the new Town-hall committee in the choice of a plan and design for the proposed building. In our last we gave a notice of the numerous sets of plans sent in.

The Rowland Hill Memorial.—The committee entrusted by the Kidderminster Town Council to select a sculptor for the statue to Sir Rowland Hill, have chosen Mr. T. Brock (formerly of Worcester), out of seven competitors. The cost of the statue will be 1,300*l.*, and it is to be of Sicilian marble, resting on a pedestal of Cornish granite. Signor Fontana's design, holding the second place in the opinion of the committee, receives a premium of 25*l.*; and No. 6 (Mr. Williamson's) a premium of 15*l.* It was resolved to invite Mr. Brock to inspect the suggested sites for the statue, with the view of reporting upon them.

BROMPTON ORATORY COMPETITION

SIR,—What the Fathers mean to do with regard to the actual building of this church remains to be seen; perhaps they will endeavour to soothe the outraged feelings of some architect who, in the unadorned simplicity of his exterior, considered that he had faithfully adhered to the expressed wishes of the Fathers in this respect, as also in denying himself the luxury of a dome.

But is it not highly absurd that there should ever be two aims for competing architects? Why should not the premium be given to him who had succeeded so well in interpreting the necessities of the case as to have produced the most suitable building? As it is, one architect gets the premium, another the job. Cannot there be one recognised system in all competitions, at once removing all chance both of unfairness and perplexity? Thus, that the referee, in his decision, bear in mind not only the architectural merits, but also the suitability of the designs to the necessities of the case; that the carrying out of the building be entrusted to him who gains the premium; and that the decision of the referee be absolutely binding. F. B.

NORWOOD SCHOOLS COMPETITION.

SIR,—In last week's *Builder* the Guardians for the Parish of Lambeth advertise for plans for the extension of schools at Norwood, and in the same paper is the account of a meeting of the Board of Guardians, from which it appears Mr. Foulsham has already prepared plans. I think, before any one prepares drawings in competition, the Guardians should engage not to allow Mr. Foulsham to compete, as he has already the advantage of knowing exactly what the Guardians want, and evidently has friends on the Board who are trying to have his plans carried out. As the affair looks so suspicious, an architect of standing ought to be called in, whose award the Guardians should bind themselves to adhere to, and to publish for the satisfaction of competitors. ARCHITECT.

SANITARY MATTERS AT DERBY.

SIR,—With a sanitary rate of 3s. in the pound during a year, one would think that sanitary work should and would be well done. Not the least thing objected to is the way that house refuse is collected. This is emptied into the gutter in front of the several houses, and shovelled and broomed up by the scavengers, and that in a very imperfect way. Now, some time since the Sanitary Authority issued notices to householders that the refuse was to be brought to the pavement in boxes; but the scavengers are too lazy to lift the boxes to the cart, so they tip them in the street, and then shovel and broom the filth in the usual way. A more unbecoming, filthy, and annoying process than this gathering of refuse cannot be conceived. Heaps of ashes, dust, pea-pods, paper, and the general miscellanea of household and culinary operations are left in the hot sun and blown hither and thither by the winds. The exposure for hours, waiting the irregular calls of the scavenger, is a great nuisance; and the shuffling imperfect way it is collected, leaves the nuisance over Sunday; and, in fact, all the week through, for much that is scattered by the wind is never again collected.

Another matter is the work of the sanitary inspector. I do not know who he is, or how his duties are assigned him, or what those duties are; but such a thing as domiciliary inspection is, I believe, a thing unknown. At least I speak from my own knowledge and that of my friends. Construction of sewers, their proper working and ventilation, and the proper cleansing of back places, have not ever come under my notice, except a complaint is made, which is rare, or a *death* occurs, when, of course, a little is attempted. Certainly Derby is far from being perfect in sanitary matters. More money expended on these, or *better* expended, would improve the health and save the pockets.

SANITAS.

RAINFALL AND SEWAGE IRRIGATION.

SIR,—The effect of the rainfall in connexion with the question of sewage irrigation has not received the attention it deserves. The following observations are submitted for consideration, in the hope that a correct view of the subject may be arrived at.

Space or area being a most important factor in its consideration, a convenient and useful scale of measure is suggested for the purpose: it is a square sub-divided into sixty-four parts, each representing ten acres, being a total of 640 acres, or a square mile. An example will show its application to the purpose:—A district of 200 acres would be represented by twenty of the sub-divisions. On it is a population of 2,000, at an average rate of ten on an acre,—certainly not a dense population. The district is provided with water-closets, sewers, ventilating-shafts, gullies, water supply, and with the means of conveying into the sewers the rain which falls on the district. Further, there is land conveniently situate for irrigation, which can be obtained, and it is advised that twenty acres will be sufficient, being at the rate of an acre for 100 persons, such area being represented by two squares. Thus are presented at one view the comparative areas of supply of sewage and rain from 200 acres and their destination, twenty acres; and the proportions are commonly considered to be quite practicable.

The sewage alone from such population would amount to about 267 tons daily; but this is more than the average daily rainfall. It is of the utmost importance to bear in mind that the land does not possess unlimited power of absorption of moisture, whether rain or sewage. It cannot absorb the rain alone which falls direct on it. The contour of the surface, the hills, valleys, brooks, rivers, all facilitate the effluence or drainage of the unabsorbable excess, which, under certain circumstances, is a very large proportion of the whole. It is quite the natural consequence, and it is not to be wondered at if failures occur in attempting to carry out plans contrary to obvious natural laws.

The effect of a rainfall of ·25 in. in such a district shall now be considered. In quantity it amounts to 25 tons per acre, or 5,000 tons on 200 acres. As it falls (possibly in a very short time, an hour or less) it flows into the sewers, which at the same time are receiving the ordinary daily flow of sewage of 267 tons. Onward the mixture flows, diluting, augmenting its bulk, till the fall of rain ceases. The manure by that time is diluted almost infinitesimally, and the water is spoilt. It flows on to its destined area, 20 acres, which is thereby reduced to a complete swamp, the quantity being equal to a rainfall of 2·63 in. on an acre, and then it flows on to pollute the water into which it is discharged, and, being further diluted, it is probably reported to be "not so bad." HENRY PHILLIPS.

Glass-cloth.—*Gastach*, or glass-cloth, is a name given by Dr. Hirzel, of Leipsic, to a gas and water-tight stuff, which he has recently patented. This is produced by placing a large smooth piece of so-called gutta-percha paper between two pieces of some not too coarse and dense material—*e.g.*, shirting (undressed),—and then passing the arrangement between heated rollers. The outer pieces of the shirting combine in the most intimate way with the enclosed gutta-percha to form a material which is impenetrable by gas and water. It may be made still denser and more resistant by being coated on both sides with, *e.g.*, copal lac. The material is said to be well adapted to form gas-tight membranes for regulators of pressure of compressed gas-bags, or sacks for dry gas-meters, as also dry gas-reservoirs.

RE "THE FORTUNE" THEATRE, AND MOORFIELDS AND ENVIRONS.

IN the article in your last issue respecting the above theatre, a certain Dr. Lambe (who met his death at the hands of the City apprentices) and the district of Moorfields came in for incidental mention. In the portion of the letter of Sir Francis Nethersole quoted, the doctor's death is thus remarked upon:—"A prodigious discredit, for which the mayor and sheriffs have been sharpely reprehended, and the Citty may chance be fined; but that will not bring the man to life againe." Sir Francis was right in his conjectures as to the City being likely to be mulcted in a fine, for the City records supply us with the evidence that the fine was subsequently inflicted. Without referring to the original records themselves, we have before us as we write a little, and, it would appear now a rather scarce, volume, entitled "A List of the By-Laws of the City of London Unrepealed, &c. Printed by Henry Kent, Printer to the Honourable City of London. 1769,"—in which we find, among several other interesting entries, the following, under the date of 17th Jan., 8 Car. I., Jos. Rainton, No. 30, fol. 50:—"*Murthers.*—A Fine of 1,000*l.*, imposed by King's Bench, for not securing the Murtherers of Lamb, to be raised on the Companies." As all the guilds or City companies most likely contributed their quota of the fine, the one thousand pounds was not long in being paid. This was in the year 1632, and during a reign in which the Corporation and Companies both willingly and unwillingly advanced large sums to the king, and for other public and interested projects.

Respecting Moorfields, we find the following entries in the little volume above alluded to:—7th August, 1606. "Moorfields, 200*l.* ordered to be paid out of the Chamber for finishing works in Moorfields, or such other sums as shall be necessary." "Rails belonging to Companies to be applied to railing Moorfields"; and in the following year, "400*l.* granted by the Lord Mayor and Court of Aldermen to be applied towards finishing Moorfields." The last entry we find anent Moorfields is under the date of 5th December, 18 Jac., 1620:—"400 marks given to bevel Moorfields." At first sight the word bevel would appear to be a misprint for level, but we may suppose the bevelling of Moorfields consisted in giving an incline to the swampy ground for drainage purposes, or otherwise slanting or bevelling the surrounding ditch, fosse, or other raised works inclosing the fields. The City sewers and ditches appear to have been in a bad state during the above-mentioned years. for we find that in 1606 the Corporation granted "two-fifteenths for cleansing the ditches," including, we suppose, those at Moorfields; and in 1632 "two-fifteenths for cleansing City's ditch." The localities of Hounds-ditch, Shore-ditch, Fleet-ditch, and Moor-ditch were not very salubrious throughout portions of the seventeenth and eighteenth centuries, whatever they might have been at an earlier date. Holy-well-mount, Shoreditch, near to the new Great Eastern-street, it is well known, was used in 1665, the year of the great plague, as a regular charnel-pit for the interment of the dead, who were buried in hundreds there at night time by the light of torches. But we are digressing: the founder of the Fortune Theatre, the Alms-houses of St. Luke's, and Dulwich College, was a noble player, and died ennobled by his great gift; but the nineteenth-century governors of the College not only ignore the rights of the poor in St. Luke's, but the respect that is due to the memory of Edward Alleyn at Dulwich and elsewhere. H.

SIR GILBERT SCOTT.

SIR,—A paragraph appeared in one of your contemporaries that Mr. William Hague, of Dublin, had been appointed architect for the works to be done at Dunsany Castle, county Meath, in the place of the late Sir Gilbert Scott.

I, as executor of the late Sir G. Scott's will, wrote to Lord Dunsany, inquiring whether this statement was accurate, and I have received a most kind letter from him in reply, authorising me to say that the statement is quite erroneous, and that should he proceed with the works his first step would be to communicate with the sons of the late Sir G. Scott.

May I ask the favour of your inserting this letter?

19, *Coleman-street.* J. H. SCOTT.

Scarborough.—The Town Council has sanctioned plans by Mr. Hawkins, C.E., for the enlargement of the harbour, &c., at a cost of 13,000*l.*

THE NORTH COAST OF KENT.

SIR,—By your favour, I have, from time to time, been enabled to call the attention of those who may be deemed to be "authorities" in this matter to the inevitable and destructive inroads of the sea in this part, and also of the total want of prevision and thought exercised in the question.

I presume the Government may possibly feel that the securing of the coast line of the Isle of Sheppey may even be deemed a national affair, and in some way, at all events, worthy of their attention.

The construction of a sea-wall from Sheerness to Margate cannot be long delayed. This should be a concrete sea-wall, and would, by its reclamation of land, be a fair investment.

Some fifteen hundred years ago the Reculver Church is credibly affirmed at four miles from the sea, *temp.* Eliz. one mile, now only protected by an apron, and the whole foreshore between this and Herne Bay is rapidly crumbling into the sea.

F. R. I. B. A.

Q. E. D.—In certain portions of our coasts the destruction is rapid,—washed into the sea; in certain other portions ground is being gained by the receding of the sea: 10 ft. per annum in 100 years, 1,000 ft.; in 1,500 years, = about 3 miles.

THE PROFESSIONAL DECORATOR.

SIR,—I have been waiting almost impatiently in hope that some able pen would take up the discussion raised upon Mr. Armitage's paper on mural decoration, and to claim for the decorative artist some share of consideration for his work and influence upon architecture.

At the conference of architects it was lavishly bestowed upon the picture painter, whose share in mural decoration is small as compared with that of the decorator, yet the last named was left out in the cold.

It is for this reason I request the indulgence of a small space. We have only to ask what a painter can do with a building. Without a knowledge of architecture, he very likely will apparently change the character of the mouldings by colour wrongly applied, the apparent size of windows will be disproportionately increased by the addition of borders, and the walls cut up into spaces in keeping with the above, and these he fills with ornament of a nondescript or medley character. An architect who knew this part of his profession would say "The building is murdered by colour; I will have none of that. Let wall, roof, and member take its proper place,—that which I assigned it; but emphasise and make it beautiful. According to the key and gradation of the mass so let the members be."

I think I have said enough to show that the decorative artist has quite as much to do with the successful finishing of a building as an artist who merely paints figures.

I know there are a few both architects and decorators who do not neglect the important part to them of the other's profession, but until this point is more fully recognised, we shall be afflicted with many abortions such as one meets with about the country called decorations.

I must say, in conclusion, that some wandering decorators look out for any word of assistance such as often occurs in your valuable journal.

BENJAMIN ARNSBY.

The Royal Dramatic College.—The necessary amount of public support not having been accorded to the Royal Dramatic College, near Woking, of late years (and we can scarcely wonder), the trustees, Mr. Benjamin Webster, Lord William Lennox, and Mr. J. W. Anson, applied to the Charity Commissioners for power to sell the property and to devise a scheme for the investment of the proceeds. By direction of the Commissioners, the property was, on the 11th inst., offered for sale at the Mart, Tokenhouse-yard, by Messrs. Farebrother, Lye, & Palmer, the arrangement being that the proceeds of the sale should be invested by the trustees, and the interest divided amongst the present inmates as out-pensioners. No bids being forthcoming, the auctioneer had to declare the property withdrawn and open for sale by private bargain. Could not some business-like committee be formed to take the matter in hand and secure the building for the dramatic profession? Vast sums of money have been spent over it.

THE END OF "JERRY" BUILDING (PERHAPS).

SIR,—As the time is an opportune one, you will allow me, through the *Builder*, to make a few remarks on the Building Act Amendment Bill which has just passed, and awaits, as I write, the Royal Assent. The first Act promoted by the Metropolitan Board of Works, and which was lost, was more extensive in its range, and consequently met a vigorous opposition on the part of those who mostly profited by speculative building abuses. The present short Bill amends the Building Act, but to a far shorter extent than the first Amending Bill promoted by the Metropolitan Board of Works, and it deals chiefly with building materials. If the provisions of the present Act are rigidly enforced, there is not the least doubt that the evils of Jerry building will be considerably minimised within the London metropolitan circuit, and this partial reform in itself will be a matter of extreme gratification to all sanitary pioneers and reformers, and I think to none more than to yourself and the *Builder*, who, for half a lifetime, have persistently and consistently advocated and aided every well-devoted effort in the direction of building and sanitary and social reform. Before, however, speculative building scandals are stamped out, other reforms will have to be accomplished, and the duties of district surveyors, local board surveyors, medical officers of health, and sanitary officers will need to be better defined. As matters stand at present in the metropolis, there is a division of sanitary duties, and of course of responsibilities, between the district surveyor and the local board surveyor; that of building construction devolving upon the former, and that of drainage on the latter, and unfortunately bad drainage, or make-believe drainage, has been productive of more evils than even bad house construction and the use of vile materials. The position and remuneration of district surveyors need a revision too, and if their efforts again are not well supported by the board they serve, and by the police magistrates, speculative building abuses must continue. A large percentage of the jerry-building element, and those who otherwise profit by building abuses, is to be found in our local boards, and all know the latter are the feeders to the Metropolitan Board, so there is always a danger of reform being injured by duties being perfunctorily performed. If a governing board will not perform its duty by prosecuting evildoers, the arms of officials are henceforth weakened, for they cannot successfully act without the support of the bodies they serve. There are also several anomalies connected with the local government of the metropolis, which go far to neutralise the efforts of sanitary and social reformers. The parish of Hackney may be cited as one of the worst instances of those anomalies, for its affairs are administered under what is termed the "tripartite" system of local rule, the duties being divided between three boards, one a life and self-elected one (the trustee board), a vestry and a district board of works constituting the other two. Here are three boards leading to plurality in appointments and other evils, not speaking of swollen expenses which could be avoided under one distinct local board. A sanitary or building abuse prosecution, possible under a local board in Edmonton, is not possible under the local board in Hackney, nearer the City. Bad building culminated recently in Hackney in houses falling, a death, a coroner's verdict of manslaughter, a subsequent prosecution, and an acquittal of the indicted. Though the District Surveyor publicly gave evidence on the inquest that he warned the builder, and drew his attention to the bad materials he was using, yet, despite of the evidence adduced and the verdict of the coroner's jury, the Metropolitan Board of Works would not prosecute. They contented themselves with reprimanding their District Surveyor, and then relegating the duty of prosecution to the Coroner's officer. The result might have been anticipated, for somebody must have been responsible for the bad work and material, if not the builder, certainly the sub-contractor or his representatives. I fear very much, sir, that in matters of drainage and foundations, much "scamping" is still likely to take place, both in the suburbs of London, and in the provinces. I have myself been witness to abominable building malpractices around London, but particularly in the East End; and as a voluntary worker, I have devoted much valuable time morning and evening for several years past to detect and expose these flagrant abuses. Even on Crown lands, sir, during the last five or six years, I have seen practices on the part of speculative builders permitted that were a crying scandal. On the borders of some of our Royal parks, ground let to speculative builders was not very long since excavated in every direction, series of pits being dug before, under, and in the rear of the houses being built, the sand dug out to depths ranging from 10 ft. to 16 ft. and upwards, and its place filled up with the most offensive and disgusting rubbish. At some personal risk, loss of time, and annoyance, I put a stop a few times to these abuses on Crown lands, and other border lands in the vicinity, by threatening to bring the matter before the attention of Parliament. I often doubted whether the attention of the Woods and Forests Commissioners or her Majesty's Board of Works was drawn to these abuses. It is possible that those officials who were responsible were badly served by their agents or subalterns. It is not many weeks since I once more witnessed building abuses on Crown lands, but I succeeded, at the risk of an assault and very foul language, in putting a stop to the sand digging and selling, and the rubbish shooting, &c.

I might write a volume on speculative building abuses and kindred evils, but I will conclude by expressing the pleasure I feel in seeing at last a direct blow aimed at the vampire "Jerry" system. One who has laboured and suffered in common with others (and against personal interest in favour of public ones) is entitled, at least for the nonce, to a public hearing upon his subject, and gives his sign manual in the most fitting columns of the *Builder*.

C. CLINTON HOEY.

LANDLORD AND TENANT.

KINO *v.* ENGLISH.

THIS was a motion, in the Chancery Division, before the Master of the Rolls, for an injunction to restrain the defendant from altering the shop and premises, 173, Fenchurch-street, and generally from "committing waste." The lease, which was granted for twenty-one years from August, 1873, contained a covenant that the lessee would not alter the present building either externally or internally.

Having become bankrupt, the lessee, Ballantine, was now represented by his trustee, English, who had sold the bankrupt's interest to one Fisher, who was now removing partitions, throwing the rooms into each other, putting in a new front and entrance, and otherwise altering the premises, in alleged breach of the covenant against waste. On behalf of the defendant it was urged that the alterations were for the benefit of the landlord, as the premises would thereby be greatly improved, and their value enhanced. The removal of a few partitions of decayed match-board could not be called "waste," and the action was really prompted by trade jealousy, the defendants being about to open a tailor's business on the premises of which Mr. Kino, who was himself a tailor, had become possessed of the reversion in the lease.

His lordship was of opinion that the acts complained of did not amount to waste, and the Courts were not anxious to assist landlords in taking any unfair advantage of their tenants. It was not a case for injunction, and therefore no order would be made on the motion, the costs to be costs in the action.

AN ARCHITECT'S CLAIM.

JAMESON *v.* THE BRICK AND STONE COMPANY (LIMITED).

THIS was a case tried at the Northumberland Summer Assizes, Newcastle-on-Tyne, the other day. The action was brought for an account for services rendered.

Mr. Cave, Q.C., in opening the case, said the plaintiff, Mr. Jameson, was an architect living in Newcastle. He sued the defendants, the Brick and Stone Company (Limited), for work done for them, and the answer they brought to the action was a most extraordinary one. Mr. Jameson, in 1873, entered into the service of Messrs. Herdman & France, under a contract, by which he bound himself to serve them for a certain time. In September, 1876, it was agreed that that arrangement should be put an end to, and that Mr. Jameson should be at liberty to start business on his own account as an architect and surveyor. At that time there was a company in existence called the Property and Building Company, and it was suggested, at a meeting of that company and Mr. Jameson, that they should have a certain proportion of the profit of Mr. Jameson's business,—that they should, in fact, become partners,—they finding, he presumed, the capital for his use; but although negotiations took place nothing came of it. There was also a suggestion made that Mr. Herdman, jun., who was only about eighteen or nineteen years of age, should become a partner with Mr. Jameson, for which his father was to contribute 500*l.* to the partnership. This was discussed, but it also fell through. No money was ever advanced by Mr. Herdman, senior, and therefore Mr. Jameson commenced business alone under the style of Jameson & Co. Mr. Jameson had never been assisted by Mr. Herdman, junior; in fact, when, a little subsequently, Messrs. Herdman & France found it convenient to turn themselves into a limited company—the Brick and Stone Company,—Mr. Herdman, junior, was transferred from the employ of Messrs. Herdman & France into that

of the company where he had been and was still a clerk. In the year 1877, Mr. Jameson was called upon to do a considerable amount of work for the Brick and Stone Company, and on the 1st of December of that year, he sent in his account, being 498*l.*, after giving credit for 87*l.* The Brick and Stone Company had several directors, many of whom had nothing to do with this matter, but there were three who had,—Mr. Herdman, who was chairman, Mr. France, and Mr. Moatt, who acted as secretary,—and these apparently set themselves to see how they could meet Mr. Jameson. First, they wrote a letter to Mr. Jameson in which they suggested that he had better call a meeting of the company (Messrs. Jameson & Co.) together to see if they would concur with the account, suggesting that the Property and Building Company and Mr. Herdman, jun., formed the company with Mr. Jameson. Mr. Jameson wrote back saying that he was capable of conducting his own business, that this was his own business, and that he wished they would pay what was properly due to him. The next step they took was one of the most extraordinary character. Mr. Jameson brought this action on the 16th of January, and on the 22nd there was a meeting got up, consisting of Mr. Herdman, sen., Mr. France, Mr. Moatt, and young Mr. Herdman, who even now was only twenty years of age. At this meeting they proposed to make a settlement of the account, and to do this they treated Mr. Herdman, jun., who was the son of the chairman, and a clerk in the employ of the company, as a partner in Jameson & Co., and got him to sign a document, by which, in consideration of the sum of 80*l.* odd, he was to release the Brick and Stone Company from this account of 498*l.* This was substantially their defence that day, but he would call some of the directors of the company themselves, and they would tell them that they knew nothing about this pretended settlement, and that for their part they were willing to pay what was due to Mr. Jameson.

Witnesses having been called on both sides, the judge pointed out that the case had occupied the court two days, and seeing how the evidence had gone, he suggested that the defendants should agree to a verdict for the plaintiff, subject to a reference. After a short consultation, the defendants agreed to this, and the jury, under the direction of his Lordship, returned a verdict for 498*l.* 7*s.* 6*d.*, subject to reference.

BRIDGES.

Musselburgh.—The wooden railway bridge which spanned the river Esk a short distance from Musselburgh station having become insecure, plans were prepared by Messrs. Bell, the engineers of the North British Railway Company, for the erection of a new bridge, and in the course of last summer operations were commenced immediately to the south of the existing structure. The work has now been completed. Resting on substantial piers of masonry, the structure consists of two spans of malleable iron, 97 ft. and 75 ft. respectively in width, being 12 ft. wider than the six spans of the old structure, while it is also 4 ft. higher from the bed of the river. The cost of the bridge has been from 2,000*l.* to 3,000*l.*

East London.—Steps have been taken for the removal of the Old Hermitage Bridge, which formed the junction between Lower East Smithfield and Wapping, and which was erected at the time of the construction of the London Docks, for a single vehicle passage only. A temporary crossing has been erected on the north side, and a much wider new bridge will be erected on the site of the old one, wide enough to allow of three vehicles to pass at the same time. Although the old piles had been submerged and driven into the London clay for fifty years, they are stated to be in an excellent state of preservation.

Dunoon.—An iron bridge over the river Echaig, on the route between Dunoon and Inveraray, was opened on the 6th inst. Mr. Archibald Gilchrist, Dunoon Castle, chairman of the District Road Trust, performed the ceremony. The engineers were Messrs. Bell & Miller, Glasgow.

NEW PUBLIC HALLS.

Bedford.—At the Bedfordshire Midsummer Quarter Sessions, the magistrates resolved to erect a new Shire-hall, from plans prepared by Mr. A. Waterhouse, A.R.A., in conjunction with Mr. Watson, the county surveyor. The cost will be about 20,000*l.* Part of the old buildings is to be retained. Referring to the decision, which was not unanimous, the *Bedfordshire Times* says that the plan adopted by the magistrates "is a compromise between an entirely new building and the patching-up of the present hall. As the proposed expenditure is little short of the estimated cost of a new building, and will leave the front untouched, there will be many who will be dissatisfied with this half-hearted policy, while the cost will still be large enough to trouble the farmers. It is noticeable that the dissentient was Mr. Bassett, who has, through Mr. Waterhouse, given to Leighton what is undoubtedly the finest business front in this county. If, for a matter of 5,000*l.* (two or three beyond the amount proposed to be voted), the county are to miss having a fine hall, with a convenient as well as a commanding façade and entry, it can only be said that the judgment of the justices compares ill with that of the notedly careful bankers of Leighton."

Whitby.—On the 24th ult. a new Foresters' Hall was opened at Whitby. It is situated in Church-street, and has been adapted to its present purpose at a cost of about 1,000*l.*

Luton.—A company, named the "Luton Alliance Hall Company, Limited," was formed in February last for the purpose of building a hall which might be used by the Alliance Band, and also for entertainments, gymnastics, &c. The cost is estimated at 1,000*l.* Arrangements have been made with Messrs. Pearson & Sons, architects, Luton, to prepare plans, &c.

Fulham.—The Fulham Vestry has deputed the Works Committee to seek for a site on which to erect a vestry-hall and new offices.

Inverness.—A dispute having arisen as to the alleged encroachment of the new Town-hall on the Exchange, the matter was referred to Mr. David Rhind, architect, who has made a report, in which he suggests a way by which the front of the Town-hall could be put back 2 ft. or 3 ft., but for the rest advises the Council to adhere to the original plan. The depth of the Exchange was formerly 38 ft. on one side, and 28 ft. on the other. Mr. Lawrie's plan reduced it to a uniform pavement of 21 ft.; and now, by Mr. Rhind's proposal, the space may be widened to 23 ft. or 24 ft. This, says the *Inverness Courier*, seems likely to be the outcome of the controversy. Another suggestion put forward is to purchase the property in the rear, and so widen the Exchange to about 50 ft. The proprietor asks 3,100*l.* for the property, and it is doubtful whether the Council could vote this money, or whether the Exchange Association could guarantee the amount of money that would be required.

NEW MARKETS.

Upton-on-Severn.—A new cattle-market has been completed and opened at Upton-on-Severn, adjoining the White Lion Hotel, from plans prepared by Mr. Price, the cost being 1,000*l.* The work was entrusted to the following local contractors:—Messrs. Parsons, builders; Mr. Crump, mason; Mr. Liddiard, ironmonger; and Mr. White, painter. The yard is computed to hold 600 sheep and 200 cattle, and land is secured for further extension of the market, if it should be found necessary.

Crewe.—The proposed purchase of a large open space of land behind Crewe Market Hall, for the future extension of the market, has been agreed to by the Crewe Town Council, a committee having already arranged a purchase from Alderman Heath, the owner, for 5,000*l.* conditionally upon the railway siding accommodation being unrestricted.

Newcastle-on-Tyne—At a meeting of the Town Council of Newcastle-on-Tyne on the 3rd inst., the finance committee submitted plans and estimates of the cost for the erection of a fish-market, in conjunction with the fish-jetty recently constructed at the Swing Bridge, in the Close. The proposed building provides for a market 140 ft. in length by 80 ft. in width, with an entrance 40 ft. wide by 36 ft. long. There will also be market-keeper's, weighman's, and other offices; and compartments for carrying on the business of a large fish-market. Provision is also made for six shops fronting the Close, each shop having a frontage of 16 ft. 6 in. The estimated cost is 15,730*l.* for the whole building.

London.—At a recent meeting of the Court of Common Council, Mr. Deputy Walter asked the chairman of the Markets Committee (Mr. Rudkin) what progress was being made in regard to the construction of a new fruit and vegetable market in Farringdon-road,—whether, in fact, there was to be a new market at all? Mr. Rudkin, in reply, stated that for some considerable time past the committee had had before them the plans, &c., for the reconstruction of the market, the consideration of which had been adjourned until a definite settlement had been come to with the London, Chatham, and Dover Railway Company on a question relating to the rise of the substructure of the market. The heads of an agreement had been prepared, and had been approved by the officers on each side, and was now waiting for the approval of the directors of the railway company. Mr. Deputy Fry asked what the committee had done up to the present time, and how much money had been expended. Mr. Rudkin replied that the committee had prepared plans and a model, and a very considerable sum of money had been expended in the excavations, in some portion of the foundations, and in underpinning some of the arches that were constructed in connexion with the Holborn Valley Improvements. These were not works, however, which would affect the question as to whether a new market should be constructed or not, but would have been necessary even had the Corporation not wanted the site for the present purpose.

GASWORKS.

Maidstone.—We have some particulars as to the extension of the Maidstone Gasworks, the consumption of gas in the town having doubled within the last twelve years. The works are being carried out under the direction of Mr. J. West, the company's engineer. The *Maidstone Journal* says the land adjoining the existing works having been obtained, the first step was to extend the river-wall a distance of some 300 ft. This wall is built with large blocks of Kentish rag stone, supplied by Mr. W. Bensted, and Portland cement, the concrete foundations being very wide and of considerable depth. The shell of the new retort-house, which has been built by Messrs. Punnett & Son, of Tonbridge, is a large and substantial erection of red brick, with stone facings. It is 150 ft. long, 68 ft. wide, and the elevation at the apex of the roof is upwards of 50 ft. The foundations are of concrete. The iron roof has been erected by Messrs. Samuel Cutler & Sons, of London. All the retorts, settings, and interior work will be done by the Company's men. A new process of drawing and charging the retorts by machinery, invented by Mr. West, will be employed. Preparations are also being made for new condensers, exhausters, scrubbers, and station meters. At a short distance from the new retort-house a large tank for ammoniacal liquor will be placed, the excavation for its reception being well nigh completed, and above this will be put four large purifiers, 24 ft. square by 5 ft. 6 in. deep. Messrs. Cutler & Sons have obtained the contract for the purifiers.

Thrapston.—The old gasworks here have been demolished, and new works are in course of erection. Mr. W. Horn, the contractor, expects to have the new buildings, comprising a large retort-house, purifying-shed, &c., finished by the latter end of August or commencement of September. The tender of Messrs. Porter & Co., of Lincoln, has been accepted for the ironwork, which comprises large hydraulic main and ascension pipes, three large purifyers, in place of the two small and old ones now in use; a Korting's patent steam jet exhauster, and other improved apparatus, in order to improve the quality as well as increase the quantity of the gas. The whole of the buildings will be elevated and the yard correspondingly filled up to a height which will effectually prevent in future the disasters which have occurred from the irruption of floods. Mr. John Eunson, C.E., of Northampton, is the engineer in charge of the reconstruction.

Plymouth.—The annual report of the Plymouth and Stonehouse Gaslight and Coke Company shows that the affairs of the company are in a very satisfactory state. The price of gas to private consumers has been reduced to 2*s.* 3*d.* per 1,000 ft., and to the public lamps to 2*l.* 14*s.* per annum, from Lady-day last; and a considerable increase in the consumption of gas has taken place during the past year. The directors, with the view of meeting the increasing demand for gas, have made contracts for the erection of a new retort-house. Larger pipes have also been ordered, to replace the present main from the Crescent to Durnford-street, which will afford a better supply to the consumers of Stonehouse generally. Mr. George Henderson, who has filled the office of secretary from the formation of the company, retired at Lady-day last, after a service of thirty-four years, and the directors have agreed that an annuity of 400*l.* be granted to him.

Wirksworth.—Messrs. Camm, Brothers, of Birmingham, have executed two windows, which have been placed by the late Mrs. Gell, of Stanton-on-Peak, in the Gell Chapel, Wirksworth. The north window represents Our Lord Teaching Humility by setting a little child in the midst of his disciples; and the Raising of Jairus's daughter. The east window has for its subjects the Resurrection and the Agony in the Garden.

CLOCKS AND BELLS.

Burnham.—The new tower and clock provided as a memorial of the late Mr. Laban Sweeting, have been "inaugurated." The tower, which is Gothic in style, is octagonal in form, and attached to the front of the Charity Schools. It is a somewhat massive structure of red brick, relieved by black dressings, with mouldings, battlements, pinnacles, &c., of cement, and at the top is an open belfry surmounted by an octagonal cupola, with a vane at the apex. On the first floor of the tower an enlargement of the school committee-room has been effected, and a spacious and convenient apartment is now available for parochial purposes. Over this is the cloak-room, in which is the clock, which has been manufactured by Messrs. Gillett & Bland, Croydon. It is constructed to strike the hours upon a bell of 2 cwt., and the four quarters on two other bells, weighing about 4 cwt. altogether. The bells were also cast and tuned in Messrs. Gillett & Bland's own bell-foundry.

Cowesby.—On the 4th inst. a new peal of bells, provided for Cowesby Church, near Thirsk, at a cost of between 500*l.* and 600*l.* by Mrs. Lloyd, of Cowesby Hall, were used for the first time. The peal has been cast by Messrs. Warner, of London, and hung by Mr. T. Mallaby, of Masham, the tenor weighing 9 cwt., and they are set in B flat.

Brailes.—A few months ago the bells of Brailes parish church were in a sad state of neglect and decay. The third and the tenor bells had been badly cracked for many years. This state of things might have long continued had not a liberal offer been made by one of the landowners of the parish to undertake the expense of re-casting the two cracked bells on condition that the rehanging of the entire peal should be effected in connexion with the general restoration of the church. The cracked bells were entrusted to the care of Messrs. Blews & Son, founders, of Birmingham, by whom they have been re-cast. The re-hanging has been carried out by Messrs. Hooper & Stokes, of Exeter.

CHURCH-BUILDING NEWS.

Walton-on-the-Hill.—The new Church of St. John the Evangelist, Walton-on-the-Hill, Liverpool, has been consecrated. The style is an adaptation of Early French Gothic. The interior is of bold proportions, the nave being 33 ft. 6 in. wide. In its present incomplete state the church consists of chancel, two transepts, and three bays of the nave, and accommodates about 600 people; and when completed according to the plans, two more bays will be added to the nave, a lofty tower and spire at the west end, and two vestries for the clergy and choir on the south side, the accommodation to be provided being for upwards of 1,000 persons. Among the donations is the costly marble reredos, the gift of Mrs. Gerard Lee, of Luton Hoo. The figure-subjects of this work, which represents the Crucifixion, were executed by Mr. T. Woolner, R.A., and the moulded and carved work is principally of red marble, relieved with gold mosaic, executed by Messrs. Earp & Co., the design of the whole having been superintended by Mr. G. E. Street, R.A. The woodwork generally was executed by Messrs. Cain & Crennell, of Mulbery-street, and the decorated panels by the architects. The figure-subjects in the pulpit, representing the four Evangelists, are being executed in sgraffito work by Messrs. Trollope & Sons. Two of the windows are filled with stained glass, one by Messrs. Forrest & Sons, of Liverpool, representing "The Blessing of the Children by Our Lord"; and the other, the work of Mr. Holt, of Warwick, has two subjects, "The Journey to the Cross" and "The Ascension," is given by Mr. James Glover. A third window, from the studio of Mr. Holiday, of London, is approaching completion. The contract for the whole of the constructional part of the church has been carried out by Mr. Hugh Yates, of Liverpool; and the architects are Messrs. Aldridge & Deacon, of Liverpool.

Maghull.—The foundation-stone of the new church of St. Andrew, Maghull, has been laid. The site of the new church is to the east of the old structure, which was originally built as a chapel-of-ease. The new building is being erected in the Early English style, and its total length will be 127 ft. by 51 ft. wide, not including the porch. The total height of the nave is 45 ft. to the ex of the roof. The ch urch is divided into nave, chancel, and north and south aisles, the first of which is 69 ft. long by 24 ft. 6 in. wide; the chancel is 27 ft. by 20 ft. 6 in., and the aisles 69 ft. by 10 ft. There is also an organ-chamber and chapel, each 15 ft. by 14 ft., and a vestry 13 ft. square. The tower is situated at the west end, and is 21 ft. square at the base. The church is being built with Yorkshire shoddy walling and Stourton stone dressings, the inside of the chancel being lined entirely with white stone. The whole of the woodwork will be of pitch pine. The building when finished will be capable of accommodating 574 worshippers. Mr. J. F. Doyle is the architect, and Mr. S. Gunning (both of Liverpool) the clerk of works, Mr. James Leslie, of Miller's Bridge, Bootle, being the contractor.

Heswall. — The parish church of Heswall, Cheshire, having been for some time in a very dilapidated condition, and the accommodation being inadequate for the requirements of the increasing population, it has been determined to restore the tower, and to rebuild and extend the church to the north-east. The additions have been designed by Mr. James F. Doyle, architect, Liverpool, under whose superintendence the works are being carried out. The work has so far progressed that on the 29th ult. the ceremony of laying the foundation-stone, or rather of placing a record of the proceeding in one of the stones of the church, took place, the laying of the stone and placing the record therein being performed by the Rev. Mark Coxon, the venerable rector of the parish. The works are being carried out by Mr. Hugh Yates, builder, Liverpool. The church, when completed, will accommodate about 500 worshippers.

Glencarse.—A new Episcopal church has been opened at Glencarse. The building is Gothic in style. The font, of Peterhead granite, was executed by Messrs. Cramb & Beveridge, Perth, and is the gift of Mrs. Greig, of Glencarse. The plans of the church were prepared by Mr. D. Stewart, Rossie Priory. The contractors were Mr. Thomas Taylor, mason, Inchture; Mr. John Gregory, joiner, Dundee; Mr. John Mackay, plasterer, Perth; Messrs. D. & W. Crabb, slaters, Dundee; and Mr. G. H. Nicoll, Dundee (who supplied the heating apparatus). The cost has been about 1,100*l.*

Madley.—The parish church of Madley, near Hereford, was recently reopened, after restoration under the direction of Mr. F. R. Kempson, architect, Hereford. The new pulpit and reading-desk are the work of Mr. Merrick, of Hereford (from designs by Mr. Lewis Powell), the pulpit being partially made up of the materials of the older rostrum; the floor has been laid with Godwin's (Lugwardine) encaustic tiles; the general contractor being Mr. Collins, of Tewkesbury. The chancel has been restored at the cost of the Dean and Chapter of Hereford, under the superintendence of Mr. Chick.

Reddall Hill.—Mr. John Cotton, architect, Birmingham, has prepared plans for the restoration of Reddall Hill Church, Old Hill. The estimated cost is 800*l.*

Aghade. — The parish church of Aghade, Ireland, has been restored, after restoration and enlargement under the direction of Mr. J. Rawson Carroll, architect, Dublin. The enlargement chiefly consists in the erection of a chancel, three of the windows of which have been filled with stained glass by Messrs. Heaton, Butler, & Bayne. The contractors were Messrs. Morrison, Brothers, of Bagnalstown.

West Bromwich.—The new church of St. John the Evangelist, West Bromwich, was opened a few weeks ago. It is situated in the south of The Lyng, near the Oldbury-road, and is built in the Early English style. It consists of nave, south aisle, and apsidal chancel, the north aisle, tower, and spire having been omitted for the present. The material is brick, with stone dressings, the interior being lined with white bricks, relieved with terra-cotta, the roof-principals and woodwork generally being of red fir, stained. The edifice has been erected by Mr. Sheasby, builder, of Leamington, from the designs of Mr. Ettwell, architect, West Bromwich, the contract sum being 4,500*l.*

Walpole.—Walpole Church, near Halesworth, has been reopened, after restoration, at a cost of about 1,100*l.* The church, which was rebuilt some 150 years ago, in what is described as "a kind of castellated style," has now been in great part again rebuilt, Mr. Eyton, being the architect, and Mr. Grimwood, of Weybread, the contractor. Gedney's hot-air apparatus has been adopted for warming purposes.

Huntspill.—St. Peter's Church, Huntspill, Somerset, has recently been reopened after restoration, at a cost of 1,200*l.*, under the direction of Messrs. Hans, Price, & Wooler, architects, Weston-super-Mare, the contractors being Mr. Thomas Searle, of Bridgewater. The peal of bells has been remodelled by Messrs. Taylor, of Loughborough.

Woolwich.—The chancel of the new church of SS. Michael and All Angels, situated near the Dockyard Station, has just been consecrated by the Bishop of St. Alban's. The edifice, which is exceedingly lofty, is in the Early English style. The nave is at present only a temporary one in iron, but when the building is all completed, it will be undoubtedly the most imposing church in the neighbourhood. Built in the main of brick, the dressings are in Bath stone, and the steep-pitched roof is covered with red tiles and crease. On plan the present works embrace a chancel, south chancel aisle, north-east vestry, and base of tower adjoining, the lower part of which, opening into the chancel, forms the organ-chamber. The building is strengthened by buttresses, and the doors, of oak, have their ironwork painted chocolate, helped by marginal lines of gold. The interior of the chancel is very imposing. Carried by long vaulting shafts, the roofs are stone-groined, filled in with brick, and the clearstory is arcaded, and is pierced by five lights. There is a triple-light east window, and the chancel aisle is divided from the chancel itself by an arcade of two bays. These are carried by large circular columns surmounted by carved capitals. There is a dwarf wall dividing the chancel from the nave; the former is reached by a rise of three steps, whilst there is a further elevation of six more ere the level of the altar is gained. The chancel-aisle floor-level, however, remains the same as the nave, and it is divided from the chancel proper by a low screen. The gas-fittings generally, which are good, are also by Messrs. Hart, Son, & Peard. The stalls, altar, and oak-work generally, as well as the reredos &c., are by Mr. Harry Hems, of Exeter, and the contract for the building has been carried out under the supervision of the architect, by Messrs. Kirk & Randall, builders, of Woolwich. The architect is Mr. J. W. Walter, of London.

Havant.—The nave of the parish church of St. Faith, Havant, was re-opened on the 25th ult., after restoration. It was originally built in 1831, and its restoration has been a part of an almost entire re-construction of the building, at a total cost of 1,500*l.*, the work having been performed under the superintendence of Mr. Abley, the agent of the contractors, Messrs. Hale & Son, builders, of Salisbury. The nave affords sitting accommodation for 270.

Twyford.—The new Church of St. Mary the Virgin, Twyford, Hants, was dedicated on the 27th ult. The old church dated from the Carolean epoch, and had long been found inadequate to meet the growing needs of the place. The new church has been erected from plans prepared by, and under the superintendence of, Mr. A. Waterhouse, A.R.A. It is constructed in flint, Bath stone, and brick, with Broseley tiles for the roofs, and encaustic tiles for the floors. The architect has conserved the ancient portions of the edifice. Four capitals of the Norman Church of St. Benedict form sedilia for the ringers in the belfry, and in the nave, the piers, caps, and bases of the transition and Edwardian Churches, and also the windows, have been used again. The building includes a nave, and two aisles, and a chancel, with south chapel, and an organ-chamber, clergy, and choir vestries. The length of the church from east to west is 120 ft., and the breadth 50 ft., whilst the tower and spire are, together, 110 ft. high. The church will seat over 500 persons. The work has been carried out by Messrs. J. H. & E. Dyer, of Alton, builders, some of the fittings being done by Mr. Heath, of Twyford.

Sevenoaks.—A new aisle has been added to St. John's Church, Sevenoaks. It is on the north side of the church, and provides 200 additional sittings. It has just been erected by Messrs. Punnett, builders, of Tunbridge, at a cost of about 1,300*l.*, Mr. Ewan Christian, of Whitehall-place, London, being the architect. It is lighted by six windows on the north side, all of which are single lights, five being of grisaille glass, while the sixth is the gift of Major German, in memory of two of his daughters, who died in infancy. There is also a window, a two-light one, in the north-west corner, the design being the presentation of children to Christ, with the words, "Suffer the little children to come unto me and forbid them not." This is the gift of Mr. Thomas Lockwood, of the Beacon, in memory of his wife.

DISSENTING CHURCH-BUILDING NEWS.

Salisbury.—Mr. Samuel Morley, M.P., laid the foundation stone of a new Congregational chapel at Salisbury on the 26th ult. The building (which is to be erected by Mrs. Hale & Sons, of Salisbury) is from a design by Messrs. Tarring & Wilkinson, of London, and will consist of an apse and two vestries, a nave, and east and west aisles, with a tower and spire, the materials to be used being Swanage stone with Bath stone dressings. The site is in Fisherton-street, exactly opposite the Salisbury Infirmary. The chapel is intended to hold from 600 to 700 persons, and will cost nearly 8,000*l.*

Goudhurst.—The memorial-stone of the new Baptist chapel, Curtisden-green, was laid on the 25th ult. The buildings consist of a chapel, with external porch, vestries, school, &c. The style is Gothic, the buildings being faced externally with local clamp bricks of a dark colour, the bays and buttresses being executed in red brick, and the copings, arches, strings, cills, and plinths being in plain and moulded white bricks; stone being sparingly used. The chapel will have an open-timbered roof, pierced for ventilation. The builder is Mr. Miles Tully, of Tudely, Tonbridge, and the architect, Mr. Wm. Theobalds.

Wroughton.—The foundation-stone of a new Wesleyan chapel at Wroughton, Wilts, was laid on the 26th ult. The building is designed in the Gothic style, and is constructed with red bricks of the neighbourhood, relieved with horizontal bands of white and black bricks, and Bath-stone dressings. Accommodation is provided for seating 240 persons, including the gallery. The architect is Mr. Orlando Baker, of New Swindon; and the contract for the whole of the works has been taken by Mr. George Wiltshire, of Swindon, at the sum of 700*l.*

ROMAN CATHOLIC CHURCH-BUILDING NEWS.

Burton-on-Trent.—The foundation-stone of a new Roman Catholic Church at Burton-on-Trent has been laid. The building is intended to accommodate about 400 worshippers. It will be of Gothic architecture, and built of brick with stone facings. Mr. Morley is the architect, and the work has been let to Messrs. Lowe & Sons, builders.

St. Alban's.—Cardinal Manning has opened the new Roman Catholic Church of St. Alban and St. Stephen, built in London-road, St. Alban's. It is the first Roman Catholic Church either built or used in the town since the Reformation. Only a portion of the building has been completed. To carry out the complete design for the church will involve an expenditure of 13,000*l.* Mr. Nicholl is the architect, and the style is Gothic.

Aiskew.—The new Roman Catholic Church of St. Mary and St. Joseph, Aiskew, near Bedale, was opened on the 4th inst. The total cost of the church will be about 2,000*l.*, most of the money being a gift by the will of Catherine, Lady Throckmorton, and the site, together with the presbytery, is the gift of Lord Beaumont. The character of the building is that of a small country church of the thirteenth century.

SCHOOL BUILDING NEWS.

Shelf.—A new school building is being erected in connexion with Whitefield Wesleyan Chapel, Shelf, near Halifax. It is Italian in style, with open-timbered roof, and comprises a room 80 ft. by 24 ft. for boys and girls, with two classrooms to each department. The architects are Messrs. Milnes & France, of Bradford; and the contractors Messrs. Firth & Son, masons, Queensbury; John Patchett, joiner, Clayton Heights; Elijah Briggs, painter; and H. Crowther, slater and plasterer, Shelf. The cost is estimated at about 1,200*l.*, but the new school is only a portion of a larger scheme which is in contemplation.

Sheffield.—The new Roman Catholic Boys' Schools, intended to take the place of the old and inadequate school building in Surrey-street, were opened on the 26th ult. The schools are practically the gift of the Duke of Norfolk, who gave the site, and expressed his willingness to defray the whole of the expenses incurred in their erection, after the sum of 1,000*l.* had been raised by the congregation of St. Marie's. The schools, which are in the neighbourhood of Leadmill-road, are designed to accommodate 400 boys. There are spacious class-rooms and teachers' rooms, a residence for a caretaker, a large covered playground in the basement, and an open arcade towards the yard. The buildings are of brick, with stone dressings, the roofs being covered with Broseley tiles. The school-rooms are warmed and ventilated by Haden's apparatus. The architects are Messrs. M. E. Hadfield & Son, the style being described as "Tudor."

Lincoln.—The new boys' school of St. Peter's-at-Gowts, Lincoln, has been opened. The architects are Messrs. Goddard & Son, Lincoln, and the style adopted is "Queen Anne." The materials used are red brick, with deeper coloured red brick dressings, the roof being covered with red Staffordshire tiles. The builders were Messrs. Cowen & Thompson. The lighting and heating have been executed by Mr. J. Elliott, Lincoln, who has fitted up the windows with Clarke's patent lever cranks. The school will accommodate more than 300 boys.

Queensbury.—New Wesleyan Schools at Clayton, Queensbury, near Halifax, have been opened. The new buildings have cost, exclusive of the site, about 2,600*l.* They are erected on the opposite side of the road to the chapel, and are Gothic in style. The principal school-room is 50 ft. by 34 ft., with a corridor at each end dividing it at one end from an infants' room, communicating with a class-room, and at the other from three class-rooms for the mixed department. Three other class-rooms are also obtained in the basement. The premises have been erected from the designs of Mr. John Drake, architect.

SCHOOL-BOARD SCHOOLS.

Sturton-by-Stow.—New Boord Schools are in course of erection here for the united district of Stow, Sturton, Bransby, and Coates. Messrs. Crosby & Sons, of Lincoln, have taken the contract for the buildings at the sum of 1,525*l.*, and the total cost will be about 1,900*l.*

Dunse, N.B.—New Board schools are about to be erected in Dunse, from plans prepared by Messrs. Herbertson & Son, Galashiels. The buildings will cost upwards of 4,000*l.*

DISASTERS.

HENRY WILLIAMS, employed at Lichfield Cathedral as assistant carver, was at work at one of the buttresses on the north side of the edifice, when, his foot slipping, he fell to the ground. He was removed to his residence, and surgical aid was procured, but he died within an hour of the accident.

Two men, named Dogherty and Mullens, met with their death at the Hanley sewerage works. One of them, while descending a shaft, fell, and was drowned in some water at the bottom. The other went to look for him, and met with a similar fate. It is supposed they were overcome by some foul air which had accumulated in the shaft.

At the village of Henley, Hants, a father and son, named Moore, were engaged in cleaning a well 70 ft. deep, when they were overcome by the noxious gas, and made signs to be pulled up. Two other sons immediately went down, but they also succumbed, and died shortly afterwards. Very little precaution would have prevented this fatality.

On the 12th inst. the Old Manchester Free Library, Campfield, which has long been considered as insecure, fell to the ground. Three men, who were engaged at work upon it, were buried in the ruins, and were fearfully injured. Their names are Thomas Quin, Nathan Macknallan, and George M'Clellan. They were removed to the Infirmary.

Michele & Carrington's Testing Machines for Cement.—The testing-machine patented by Mr. Michele, who is of the firm of Francis & Co., cement-makers, Vauxhall, was used by the jury in judging the quality of the various cement exhibits in the Paris Exhibition, in which that exhibited by Messrs. Francis & Co., of Vauxhall, stood the highest test, viz., 1,300 lb. on the 2¼ in. section. This cement-tester is now very largely used, and has been employed by H.M. Government on nearly all the depôt barracks they have erected throughout the country. The wire-tester and paper-tester, on the same principle, are also being largely used; though, owing to their later introduction, their adoption is not, as yet, so extended.

DECORATION OF ST. PAUL'S CATHEDRAL.

THE Committee have fallen back on a model of the dome decorated by the late Alfred Stevens, and have published a long report, to which we shall refer before long.

"All that the sub-Committee ask the Executive Committee at present to sanction is that they be allowed—first, to enter into a contract with Mr. Leighton for the preparation of a cartoon for one of the large circles, at an expense of 600*l.*, with the understanding that if the work is proceeded with he is to be employed, if he wishes it, for the other seven great circles on similar terms. Second, in like manner, to contract with Mr. Poynter for all the figure subjects on two of the ribs, and all the others in the intermediate space, at a price not to exceed 1,550*l.*, with a like understanding as to the remainder. Third, to employ Mr. Stannus to prepare the full-sized cartoon as above described; and, fourth, to engage the services of Mr. Penrose till at least this cartoon is fixed *in situ* on the dome, by which several proceedings, with their incidental minor expenses, a total liability will be incurred of from 3,500*l.* to 4,000*l.* It is calculated it will require at least one year from the time of giving the orders to complete these preliminary works, before which time it will not be necessary to ask a sanction for any further expenditure that may be determined upon."

To this the Dean and Chapter have assented.

VARIORUM.

WE understand that Capt. Calver is preparing a rejoinder to Sir Joseph Bazalgette's reply to his October report upon sewage disposal. A little detention will occur in its appearance, as the writer is adding to certain observations upon the currents of the Thames.——Mr. R. Norman Shaw, R.A., is the author of a Book of Designs for Cottage and Villa Architecture in Concrete, which is on the eve of publication. The drawings of the entire work are by Mr. Maurice B. Adams, A.R.I.B.A., and these have been reproduced by photo-lithography. The plates are about thirty in number, and include some of the buildings erected at the Paris Exhibition and elsewhere not before published.—"The Report of the Highway and Sanitary and Public Health Joint-Committees of the Paddington Vestry on Wood and other Pavements," just now published by order of the Vestry, contains a considerable amount of information useful to those who are inquiring as to pavements.——The July Number of the *Victoria Magazine*, conducted by Miss Faithfull, includes a photograph of Mrs. Brassey. This magazine has lately made a start upwards.

Miscellanea.

Continuous Footboards on Railway Carriages.—Colonel Yolland's report on a fatal accident which occurred on the 3rd ult. to a female passenger, at the Bishopsgate-street Station of the Great Eastern Railway, has been issued. The carriages were not fitted with a continuous footboard, but had iron steps outside each door. Colonel Yolland says that if the carriage had been fitted with a continuous footboard it is highly probable that, although the woman might have been injured from her own imprudence in getting out of the train after it had started, she would not have lost her life. Colonel Yolland adds:—

"The Great Eastern Railway Company have, I understand, fitted somewhat more than two-thirds of the carriages which run in their suburban trains with continuous footboards, having arrived at the conclusion that these continuous footboards, if placed at a proper distance from the edges and above the surface of the platforms, will materially tend to diminish the number of this class of accident. But I do not learn that this company have as yet recognised the necessity for substituting continuous footboards for these iron doorsteps on all the carriages that run on all their lines. It may be that a greater portion of the accidents of this class occur on the suburban traffic of the principal railways which have termini in London; but there is no doubt whatever that they do occur elsewhere; and I am not aware of any reason why these continuous footboards should not be affixed to all passenger carriages, and extend from the outer ends of the buffer castings at the end of each carriage so as to get rid of the open space between adjacent carriages fitted with long buffer-rods."

The Wilberforce Memorial Church, Southampton.—The Prince of Wales has fixed August 13th for laying the dedication stone of the new parish church of St. Mary, Southampton, which is to be rebuilt as a memorial of the late Bishop Wilberforce, whose son, the Rev. Basil Wilberforce, is rector of the parish.

The Artists' Benevolent Fund.—We hear, with much pleasure, that the Royal Academy have voted 100*l.* to the Artists' Benevolent Fund. A few day sago, too, the treasurer of this fund received a legacy of 107*l.* from Mr. J. J. Stainton. This will prove encouraging to its officers.

Experiments with Dynamite at Portland.—A series of experiments with dynamite were made a few days ago in Messrs. Mitchell & Co.'s quarries at Portland in the top and bottom "capstone." Two sections of rock were operated on simultaneously,—a section of capstone next the Portland bed, into which were bored the holes in line 9 ft. apart, and each 3 ft. deep, well planned to cut and to work to each other. The other part operated on was a section of top cap overlying the bottom capstone, but a step back, and into which four bore-holes had been made 3 ft. deep each and 9 ft. apart, in line with each other. The seven holes in the two sections were charged with 10 lb. of dynamite, and electric fuses inserted, coupled up together in circuit by small copper connecting wire, insulated with gutta-percha. The holes were then filled up with water in lieu of tamping or stemming, and the end wires connected to the two cables leading to the electric machine a safe distance away. The quarry was then cleared of men, and the signal "all clear" having been given, the electric machine was unlocked, the cables attached to the terminals, and by turning the handle of the machine a few revolutions, a current of high tension electricity was sent along the cables through the fuses, exploding the seven charges simultaneously. On examination, it was found that the three charges in the bottom capstone had removed a section of rock 42 ft. 6 in. long by 7 ft. 6 in. wide, by 5 ft. deep to the bed below, equal to 59 cubic yards,—equal to 132 tons 15 cwt. The four charges in the top cap had removed a section of rock 42 ft. long by 5 ft. 3 in. wide, by 7 ft. deep to the bed of lower capstone, equal to 57 cubic yards,—equal to 128 tons 10 cwt. The rock was broken up into blocks from five to fifteen tons each, so effectually that the whole lot operated upon,—261 tons 5 cwt.,—was removed clean away by quarrymen in two or three days. On a subsequent day another lot was operated on with equal effect. The experiments were conducted under the superintendence of Mr. Read, the local dynamite agent, by Mr. John Harris, travelling instructor to Nobel's Explosive Company, Glasgow.

Farming in Zanzibar and Freed Slave Labour.—Actual experience of this has been had by the Universities Mission at Zanzibar during the last three years. The chief establishment is at Mbweni, four miles from the town itself, where there is about 150 acres of land under cultivation. Effective communication with the town has been a great difficulty, but has at length been established by means of bullock-carts, for which a road had first to be made. These were constructed on the spot, the work of the carpentering and smiths' department of the school and industrial establishment at Kunigani. Great as has been the difficulty of starting all this, the difficulty of maintaining it seems even greater, as the bullocks are found to die in large numbers. As a last resource it has been determined to introduce into Zanzibar a traction-engine of special construction, which will be used as a locomotive, and also stationary to drive a saw and turning lathe. The sum required for this is not less than 500*l*., and it is earnestly hoped that many who see this will be induced to contribute towards it. No profit can ever be expected to accrue to any one from the work. Further information may be had from the Rev. S. Randolph Dunnington, York, and subscriptions will be gladly received by Messrs. Hoare & Co., Fleet-street.

The Metropolitan Fire Brigade have just added to the plant of the new chief station in the Southwark Bridge-road two light draught steam fire-engines, specially suited for rapid transmission to a fire. These engines were delivered on Thursday, the 11th inst., having been previously tested on the premises of the makers, Messrs. Shand, Mason, & Co., in the presence of Captain Shaw and his officers. Various improvements have been introduced; by means of those in the boiler, steam was raised from cold water to 100 lb. on the square inch in six minutes and a half, this being an acceleration of time by about three minutes or four minutes, as compared with the engines previously in use. The increasing height to which warehouses and public buildings are now carried in London rendering it necessary for increased pressure on the water-jet, this requirement has been met in these engines by giving an increased area of steam cylinder as compared to the water cylinder.

Should Horses be Shod?—This question has lately given rise to a very interesting discussion, having an important bearing on the question of street pavements. Mr. George Ransom has written to the *Times* to advocate using horses without shoes. He says that since 1862 he has constantly done so, though he has owned over 200 horses at one time, and used them for all kinds of purposes over rough roads. Their hoofs required paring sometimes, but they grew so tough that they could not be cut with an ordinary drawing-knife, but they required steel nippers. He argues that though horses used to being shod would wear their hoofs out quickly if used immediately after having their shoes taken off, the same result would not follow if they were brought gradually to regular work, thus giving time for the soles of the hoofs to acquire the necessary hardness and toughness. On the London asphalte Mr. Ransom thinks horses would go much better and more safely unshod. Commenting on the discussion, the *Lancet* says,—"The proposition will crop up at intervals until a rational view of the subject comes to be taken. As a matter of physiological fitness, nothing more indefensible than the use of shoes can be imagined. Not only is the mode of attaching them by nails injurious to the hoof: it is the probable, if not the evident, cause of many affections of the foot and leg which impair the usefulness, and must affect the comfort of the animal. Whether horses could work on our roads without some protection is another question. We think it would be found that the natural structure would adapt itself to any ordinary requirement. There is, however, a wide difference of opinion upon this point among authorities on horse management, and the problem is not likely to be faithfully solved until the experiment has been tried . . . . . It should, however, be understood that the experiment must be tried with colts that have never been shod. This is an essential condition of the test."

Architects and the "Athenæum."—For a long time past some foolish and malignant person has been allowed by the proprietors of the *Athenæum* to damage their property, and has succeeded to a larger extent than probably they imagine. We would point to his last achievement in that direction. An attempt is being made to collect funds for works stated to be needful for the preservation of the fine church of St. Peter Mancroft, Norwich. The vicar and churchwardens appeal for aid in their work, and here is what this *gentleman* of the press has been permitted to say of the whole architectural profession:—

"While we advocate maintenance of this fine architectural and historical building, of which the vicar and his colleagues are the trustees for posterity, it is necessary to protest against the employment of an architect in this as in similar cases, because an architect's professional instincts, not less than his personal interests, may,—at least so long as the 'five per cent.' practice obtains,—lead him to do that which cannot by any possibility be done without destruction of all that is valuable to the future,—all that Norwich men ought to preserve and venerate in St. Peter's. If preservation and due maintenance of what time has honoured, if to retain all that history prizes in Mancroft Church, be really the desire of the vicar and churchwardens, let them employ an engineer, who can do all that is wanted, and probably at one quarter of the cost of what an architect would charge."

The slander of this precious paragraph, which is on a par with the ignorance it exhibits, has been expressed on many previous occasions in the same pages.

Hereford Middle Class College.—The works of the new Middle Class College at Hereford are being rapidly proceeded with. The contract was taken by Mr. James Bowers, of Hereford, and since operations have commenced the work (under Mr. Hobson, the foreman) has been carried on with great expedition. The building will be in the Early Gothic style, and Mr. Kempson is the architect. It is not intended at present to complete the whole of the buildings, the contract for the whole erection being 12,729*l*. The complete plan of the building comprises a central block, surmounted by a clock-tower, with two wings. At present, however, it is only intended to complete the centre and the west wing, so that the clock-tower will form the eastern end. The contract for the present work is 9,529*l*. The building will be erected of red brick, manufactured by the contractor at his brick-yard, which is situated a short distance only from the site; the dressings will be of Bath stone, relieved by terra-cotta bricks and black bricks. The roof will be covered with patent Broseley tiles of different colours. The college will be built with a view of accommodating 100 boarders besides day-boys.

TENDERS

For works of sewage utilisation at Burslem, Staffordshire, for the Burslem Local Board. Mr. E. Richards, engineer.

Contract A.—Engine-house, boiler-house, and coal depôt:—

Mackay	£1,728 0 0
Drewitt & Pickering	1,714 0 0
Barlow	1,640 0 0
Matthews	1,490 0 0
Bowden	1,479 0 0
H. & R. Inskip (accepted)	1,382 0 0

Contract C.—Making and delivering cast-iron pipes, 12 in., 18 in., and 21 in. diameter:—

Spittle	£4,656 14 0
Cochrane & Co.	4,405 13 7
Oakes & Co.	4,364 8 0
Sylvester	4,059 15 4
S. & J. Roberts	4,042 13 7
Stacey, Davis, & Co.	3,912 7 1
Firmstone (accepted)	3,834 1 8
Brymbo Company	1,367 0 0

Contract D.—Laying and jointing the rising main, constructing intercepting sewers, straining-chambers, suction-well, and tank:—

	Pipe-laying and Sewers, &c.	Covered Tank only.
Walker	£3,641 8 3	£2,547 18 11
Mackay*	3,139 0 0	2,201 0 0
Drewitt & Pickering†	2,509 0 0	2,833 0 0
H. & R. Inskip	—	1,937 0 0

In one amount.

Smith	£4,123 0 0
Macguire	7,200 0 0

* Accepted for pipe-laying only. † Withdrawn.

Contract E, for open tank, to hold 500,000 gallons:—

Walker	£1,199 7 0
Drewitt & Pickering (accepted)	1,143 11 8

For foundations, &c., for a warehouse, Friday-street and Watling-street. Messrs. Ford & Hesketh, architects:—

Shaw & Co.	£3,521 0 0
Conder	3,490 0 0
McLachlan & Sons	3,350 0 0
Peto, Bros.	3,238 5 6
Browne & Robinson	3,235 4 6
Adamson & Sons	3,145 17 8
Scrivener & Co.	2,953 10 8
Ashby & Horner	2,932 0 0
Lawrence	2,860 0 0
Ashby, Bros.	2,777 0 0

For the erection of a detached villa residence, Baldslow-road, Hastings, for Mr. J. Reeves. Messrs. Cross & Wells, architects:—

Wood	£2,221 0 0
Womersley	2,204 0 0
Rodda	2,183 0 0
Eldridge	2,167 0 0
H. & C. Harman	2,165 0 0
Geary	2,118 0 0
Buller	2,041 0 0
Vidler	2,038 0 0
Ditch (accepted)	1,950 10 0

For alterations and additions to premises, George-street, Hastings, for Mr. J. H. Pearch. Messrs. Cross & Wells, architects:—

Womersley	£1,683 0 0
Cruttenden	1,665 10 0
Eldridge	1,655 0 0
Ditch	1,642 10 0
Vidler (accepted)	1,599 0 0

For the erection of a detached villa residence, Clive Vale Estate, Hastings, for Mr. C. Davenport Jones. Messrs. Cross & Wells, architects:—

King	£1,300 0 0

For Gospel-hall and new premises, Hoxton, for the Rev. A. T. Edwards, M.A. Messrs. Waring & Nicholson, architects. Quantities supplied:—

Howard	£3,670 0 0
Staines & Son (too late)	3,284 0 0
Hammond	3,270 0 0
Lapthorne (accepted)	3,089 0 0
Jarvis & Son (withdrawn)	2,836 16 0

For the second enlargement of Congregational Church, Carlisle. Mr. Ralph Nicholson, architect. Quantities supplied:—

Laing (accepted)	£1,413 0 0

For the erection of cowsheds and piggeries at Mitcham Schools, for the Guardians of the Poor of the Holborn Union. Mr. H. Saxon Snell, architect:—

Bamford	£440 0 0
Sabey & Son	393 0 0
Patten	333 0 0

For works in strengthening throughout the roof of Bouverie-road Chapel, Stoke Nowington. Mr. George McDonell, architect:—

Catlin (accepted).

For repairs, painting, &c., to Warehousemen and Clerks' Schools, Russell-hill, West Croydon. Messrs. Burney & Monday, architects:—

Saker	£572 0 0
Larnea	526 10 0
Josolyne	465 0 0
Smith	450 0 0
Mines (accepted)	321 0 0

For alterations, &c., No. 18, Hatton-garden, for Messrs. Booth & Fox. Messrs. Clarkson, architects:—

Mody	£249 0 0
Ward	247 16 0
Somerville & Hill	237 0 0
Mills	229 0 0
Smith	187 10 0
Cox	175 10 0
Vincent	175 0 0
Cook & Co.	170 0 0
Ranson	160 0 0
Heather	153 10 0
Eady (accepted)	102 0 0

For erecting four premises in Watling-street and Bread-street, City, upon the former site of All Hallows Church. Mr. Alexander Peebles, architect. Quantities supplied by Mr. W. E. Stoner:—

Scrivener & Co (accepted).

For farmhouse and buildings at Greasehays Farm, Stockland, Devon. Mr. Herbert J. Jones, architect :—

Clarke & Turner	£879 11 0
Minns	830 0 0
Trott	755 0 0

For alterations and repewing the Wesleyan Methodist Caspel at Redwick, near Bristol. Mr. Herbert J. Jones, architect :—

	Pitch Pine.	Yellow Pine.
Stephens & Bastow	£520 0 0	£493 10 0
Cowley	480 0 0	470 0 0
Gay	410 0 0	375 0 0
Humphreys	395 0 0	371 0 0
Wilkins & Hill	365 0 0	350 0 0
Lewis & Edbrooke	355 0 0	339 0 0

For seven houses in Maygrove-road, Kilburn. Mr. W. Smith, architect :—

Johnson	£4,457 0 0
Mansbridge	4,405 0 0
Beach	4,363 0 0
Martin	4,275 0 0
Somerville & Hill	4,252 10 0
Temple & Foster	4,245 0 0
Wicks	3,783 10 0
Prout	3,350 0 0
Taylor	3,325 0 0

For the erection of two houses, with shops, at Herbert-road, Plumstead, for Mr. R. Webb. Mr. E. Taylor, architect. Quantities supplied :—

Howe	£1,934 0 0 !
Johnson	1,450 0 0
Parker & Evans	1,439 0 0
Smith (accepted)	955 0 0 !

For alterations and additions to the Cambridge Music Hall, for Mr. Nugent. Mr. J. T. Robinson, architect :—

Bracher & Son	£368 0 0
Stamp & Bowtle	364 0 0
Garrud	355 0 0
Smith	330 0 0
Gibbon & Mitchell	325 0 0
Andrews	290 0 0
Kiddle & Son	280 0 0

For the removal of the present pier and coustruction of a new promenade pier, with landing-stages, &c., at Bournemouth, in the county of Hampshire, for the Commissioners of Bournemouth. Mr. E. Birch, engineer. Quantities supplied by Messrs. R. L. Curtis & Sons :—

Finch & Co.	£28,462 17 6
Gardiner & Co.	24,180 5 2
Phillips	24,000 0 0
Dixon	22,782 0 0
Laidlaw, Sons, & Caine	22,424 0 0
Shaw	21,900 0 0
Bergheim & Co. (accepted)	21,458 0 0

For alterations, additions, &c., at the Angel, Stratford, for Messrs. Smith, Garrett, & Co. Messrs. Hills & Fletcher, architects :—

Johnson	£986 0 0
Cocks & Co.	974 0 0
Hearle & Son	815 0 0
Alexander (accepted)	749 0 0

For the erection of a new house at Home for Little Boys, Farningham-road, Kent. Messrs. Spalding & Evans, architects :—

Downs & Co. (accepted).

For the erection of a new store and cart shed, at Marsh Gate-lane, Stratford, Essex, for Messrs. Harris. Mr. J. T. Newman, architect. Quantities supplied by Messrs. R. L. Curtis & Sons :—

Morter	£567 0 0
Hosking, Bros.	547 0 0
North, Bros.	525 0 0
Allen	480 0 0
Lawrence	460 0 0
Abrahams (accepted)	453 0 0

For alterations and additions to Harrow-green Schoo's, Leyton, Essex, for the Leyton School Board. Mr. J. T. Newman, architect. Quantities supplied by Messrs. R. L. Curtis & Sons :—

Sargeant	£3,154 0 0
Hosking, Bros.	2,937 0 0
Downs	2,867 0 0
Abrahams	2,852 0 0
Reed	2,772 0 0
Norton & Son	2,751 0 0
Arber	2,740 0 0
Morter (accepted)	2,727 0 0

For alterations to 38, Knightrider-street, E.C. Mr. R. Creed, architect :—

Body	£450 0 0
Creecher	447 0 0
Cocks	434 10 0
Allan & Son	416 0 0
Gould & Brand	343 0 0
Sayers	338 10 0
Sims	265 10 0

For new Baptist chapel, North-end, Finchley. Mr. Morton Glover, architect :—

	In Kentish Rag.	In Red Bricks.
Colls & Son	£4,309 0 0	4,092 0 0
Nightingale	4,291 0 0	4,056 0 0
Shepherd	3,657 0 0	3,370 0 0
Staines & Son	3,546 0 0	3,526 0 0
Gould & Brand	3,329 0 0	3,189 0 0

TO CORRESPONDENTS.

A. P. (list and amounts should have been sent).—Sub-Contractor (it depends on the terms of contract. We cannot advise in private arrangements).—J. P. (will give every attention to such communications).—G. McD. (names of tenderers and amounts should have been sent).—F. B.—F. & H.—T.—T. C. S.—C. & W.—E. M. R.—J. W. S.—G. D.—L. P.—J. K.—M. B. A.—W. M.—A. S.—H. P.—G. & M.—T. G.—W. B.—A. C.—C. C. H.—H. J. J.—Mr. R.—A. B.—J. B. M. W.—H. S. S.—G. W. S.—W. W. L.—G. B.—J. P. J.—E. P. W.—D. & Co.—C. & Sons.—H. & F.—S. H.—G. W. F. (too late for this week).

Erratum.—In paragraph headed, "Tunnel Accident in Germany," p. 783, line 10 from top, should read "limestone of the *firmest* description," not "finest."

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under ..... 4s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

Terms for series of Trade Advertisements, also for Special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c. may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about THIRTY words) or under ..... 2s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

REPLIES TO ADVERTISEMENTS,

Addressed Box ——, Office of "The Builder,"

Cannot be forwarded, but *must* in all cases be *called for*, and the Office Receipt produced.

THE CHARGE FOR A BOX IS AS UNDER :—

For "Situations Wanted" Advertisements ..... 3d. per Week.
For all other Advertisements ..... 6d. per Week.

PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, King-street, Covent-garden, W.C. to
DOUGLAS FOURDRINIER. Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for TESTIMONIALS left at the Office in reply to Advertisements, and strongly recommends that COPIES ONLY should be sent.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied *direct* from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum. *prepaid.* Remittances payable as above.

Bath Stone of Best Quality.
RANDELL, SAUNDERS, & CO. (Limited),
Quarrymen and Stone Merchants.
List of Prices at the Quarries and Depôts; also cost of transit to any part of the Kingdom, on application to
Bath Stone Office, Corsham, Wilts. [Advt.]

Bath Freestone in Blocks of all sizes, warranted sound, and delivered at any Port or Railway Station.—YOCKNEY & COMPANY, Sole Owners of the CORSHAM DOWN QUARRY, Corsham, Wilts, to whom all letters should be addressed. [ADVT.]

Yorkshire Stone.—Every description Sawn or Worked, ready for fixing if required. Sawn Staircases, Sawn Balconies, Sawn Landings, Sawn Steps, Sawn Coping, &c.
THOMAS WOOD & CO., Spinkwell and Cliff Wood Quarries, BRADFORD, YORKSHIRE.
London Depôt: Bridge Wharf, 283, Kingsland-road, N.E. Mr. J. J. Griffiths, Agent. [ADVT.]

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office :
No. 90, Cannon-street, E.C. [ADVT.]

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.]

VERITY BROTHERS.
Patent Ventilator, or Air-Propeller, for the introduction of Cold or Warm air into Dwellings, &c.
The machine may be seen in action at their Show-rooms, 127, Regent-street, London, W.
The apparatus consists of a drum with a double set of fans, which are worked by a fly-wheel placed in the centre, and on the same axle as fans. The motive for this fly-wheel is arrived at by a small jet of water being directed on to it, causing both the wheel and fans to revolve with great velocity; the air passing through the machine at a rate equal to 2,500 feet per minute, if desired, according to size of apparatus.
N.B.—The above machine may be used either as an exhauster or injector, as may be preferred, or both objects combined.
Also Patentees of the Fireclay Burners for Gas Fires and Cooking Purposes, and Patentees of the Tubular Gas Boiler for Baths and Conservatories, &c.
Designers and Manufacturers of Lamps and Candelabra.
Office and Works, 155, Queen's-road, Bayswater, W. [ADVT.]

Whitland Abbey Green Slates.—These slates are of a grey green tint, are stout, and made in all sizes. A large stock available for immediate delivery.—For further particulars, apply to MANAGER, Clynderwen, R.S.O., Carmarthenshire. [ADVT.]

J. Sessions & Sons, Docks, Gloucester, Manufacturers of ENAMELLED SLATE and MARBLE CHIMNEY-PIECES, URINALS, &c. WELSH ROOFING SLATES direct from Quarries to any Station in the Kingdom. Reduction in Price of Small Sizes. [ADVT.]

MICHELMORE & REAP,
Manufacturers of
CHARLES COLLINGE'S PATENT
COLLINGE'S PATENT HINGES, LEVER, SCREW, & BARREL BOLTS
and IMPROVED GATE FITTINGS of every Description.
Discount to Builders. Illustrated List two stamps.
36A, BOROUGH ROAD, LONDON, S.E.

THE LONDON DRAWING OFFICE,
98, LONDON WALL, E.C.
For the execution of high-class Architectural Draughtsmanship. Perspectives outlined, etched, or coloured; Designs; Sets of Plans; Detail and Working Drawings; Tracings, &c on moderate terms.
ETCHINGS for PHOTO-LITHOGRAPHY.
SPECIALITY for COMPETITION WORK.
Manager, Mr. EDWARD H. LLOYD,

MARION & CO.'S.
FERRO-PRUSSIATE PROCESS, for reproducing Transparent Drawings, by the use of their prepared Paper, Light, and Water. No chemicals required. Prospectus on application.—MARION & CO. 22 and 23, Soho-square.

Price 1s. or post-free for 14 stamps. New Edition,
ILLUSTRATED CATALOGUE of STABLE FITTINGS, 90 pages, with full description and prices of the most important inventions and improvements in Stable and Harness-room Fittings, Stable Paving, Drainage, Ventilation, &c.
ST. PANCRAS IRONWORK COMPANY, St. Pancras-road, London, N.W.

Now ready, with 42 Illustrations, cr. 8vo. cloth, price 6s. post-free.
MR. BANISTER FLETCHER'S NEW TEXT BOOK,
QUANTITIES,
in Tabulated form; explanatory of the best methods adopted in the measurement of Builders' Work, &c. with Tables of the various Trades, Tables of Constants for the valuation of Labour, &c.; and a complete Index for ready reference.
"A good treatise, by a competent master of his subject."—*Building News.*
London: B. T. BATSFORD, 52, High Holborn.

This day, crown 8vo. with Wood Engravings and Plates, 12s.
TRAMWAYS: their CONSTRUCTION and WORKING, with special reference to the TRAMWAYS of the United Kingdom. By D. KINNEAR CLARK, M. Inst. C.E. Author of "A Manual of Rules, Tables, and Data," &c.
"An exhaustive and practical work."—*Building News,* May 3, 1878.
"Indispensable for students of the subject."—*Builder,* June 29, 1878.
CROSBY LOCKWOOD & CO. 7, Stationers' Hall-court, London. E.C.

With Illustrations, demy 8vo. cloth, 4s.; by post, 4s. 4d.
CONCRETE: its USE in BUILDING; and the CONSTRUCTION of FLOORS, ROOFS, &c.
By THOMAS POTTER,
Clerk of the Works to the Right Hon. Lord Ashburton.
London: F. W. REYNOLDS & CO. 73, Southwark-street, S.E.

By THOMAS MORRIS, Architect.
HYDROSTHETICS of the CISTERN, DRAIN, and SEWER, with Diagrams ..... 0s. 6d.
"A more useful *brochure* has never been published."—*Metropolitan.*
A HOUSE for the SUBURBS, with Designs. 3rd edit. 12s. 6d.
A CLUE to RAILWAY and OTHER COMPENSATION.. 4s. 6d.
DILAPIDATIONS, ECCLESIASTICAL and GENERAL .. 4s. 6d.
BRITISH CARPENTRY: Gothic Roofs. Illustrated ... 6s. 6d.
PERSPECTIVE or GRAPHIC PROJECTION: Parallel, Diagonal, Pan-angular, Graceful. With Diagrams ..... 3s. 6d.
London: SIMPKIN, MARSHALL, & CO.

Imperial 16mo. cloth, 4s.
POSTS and TELEGRAPHS, PAST and PRESENT. With an Account of the Telephone and Phonograph.
By WILLIAM TEGG, F.R.H.S. Author of "The Knot Tied," &c.
Dedicated, by permission, to the Secretary of the General Post Office, London.
London: WILLIAM TEGG & CO. Pancras-lane, Cheapside.

IMPORTANT to ARCHITECTS and STUDENTS.
ALFRED TARRANT, 50, BEDFORD-STREET, Covent-garden, having purchased the entire remainders of the two following important WORKS, recently published by the late Firm of Day & Son (Limited), is enabled to offer them at the following low prices for cash :—
Published at 4*l.* 4s. offered at 18s.
ARCHITECTURAL SKETCHES from the CONTINENT. Views and Details from France, Italy, and Germany. By WILLIAM NORMAN SHAW. 100 plates folio, half bound, gilt edges.
Published at 3*l.* 13s. 6d. offered at 18s.
SPECIMENS of MEDIÆVAL ARCHITECTURE, chiefly selected from examples of the twelfth and thirteenth centuries in France and Italy. By W. EDEN NESFIELD. 100 plates folio, half bound, gilt edges.
London: ALFRED TARRANT, 50, Bedford-street, Covent-garden.

JOHN WHITEHEAD & CO.'S
New Illustrated Catalogue,
1878,
With Revised List of Prices of
BRICK, TILE, and PIPE MACHINES,
With all the Recent Improvements,
CLAY-CRUSHING ROLLER MILLS,
BRICK and TILE PRESSING MACHINES
PATENT SANITARY PIPE MACHINES,
PUG-MILLS, &c., &c.,
Can be obtained, post free, by application to
JOHN WHITEHEAD & CO.,
Albert Works, Preston.